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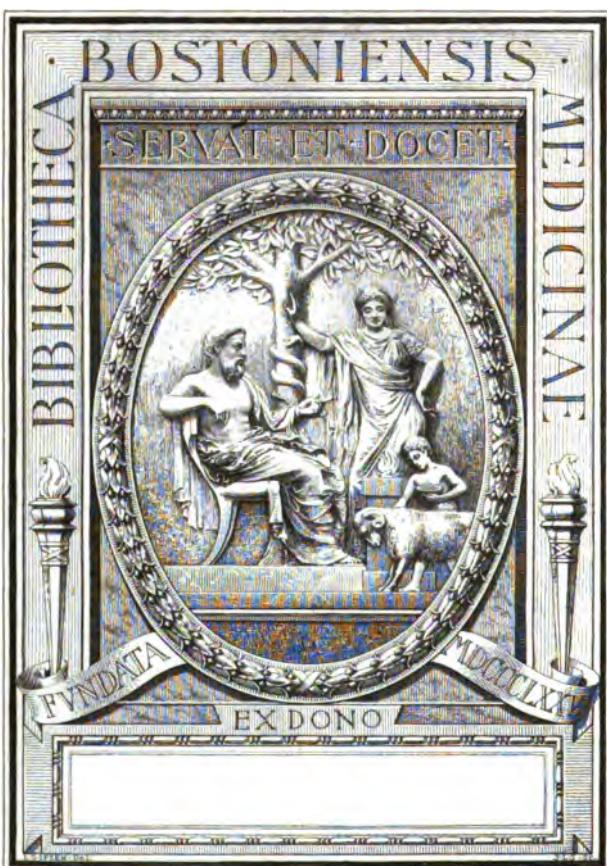
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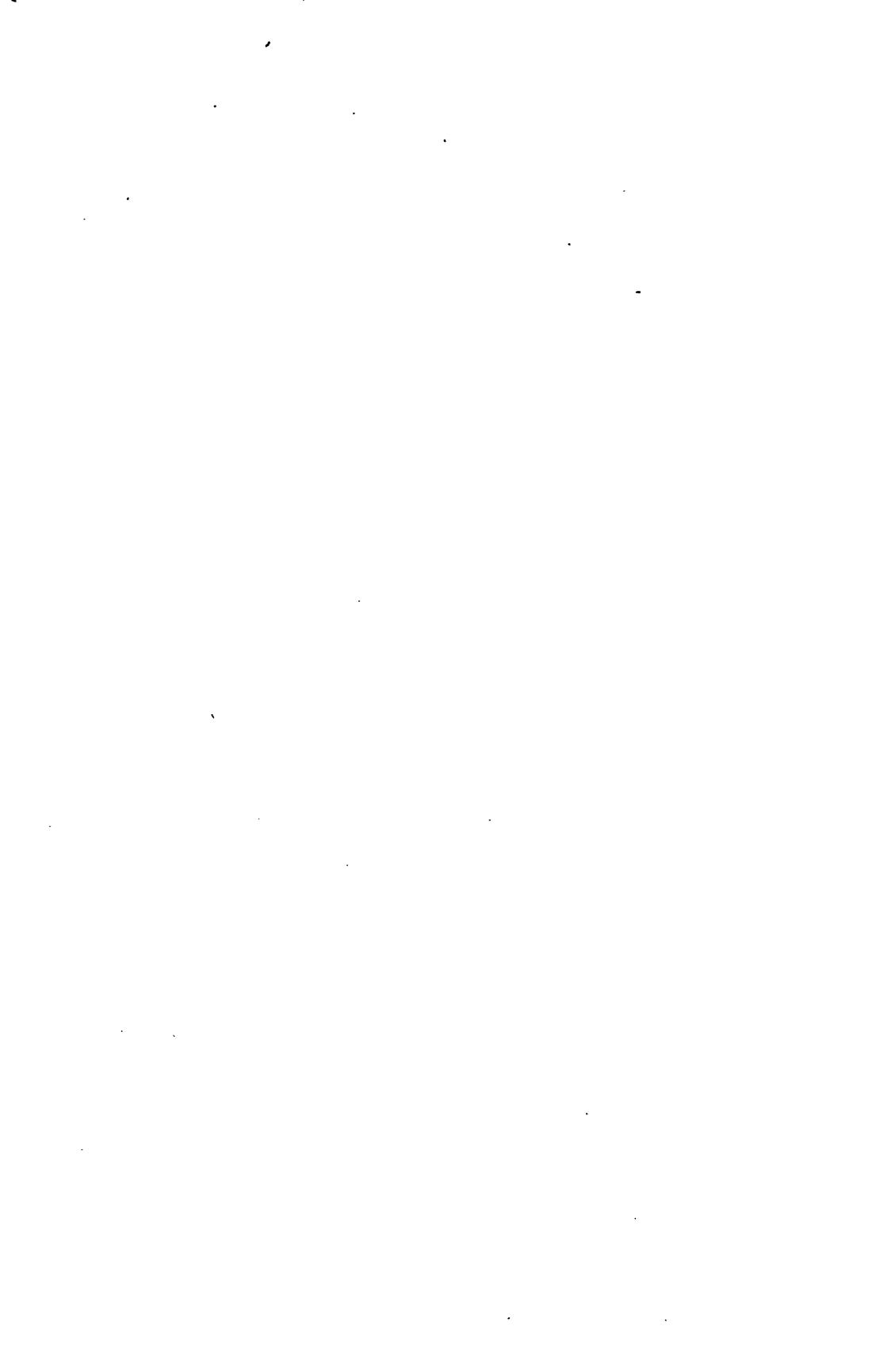
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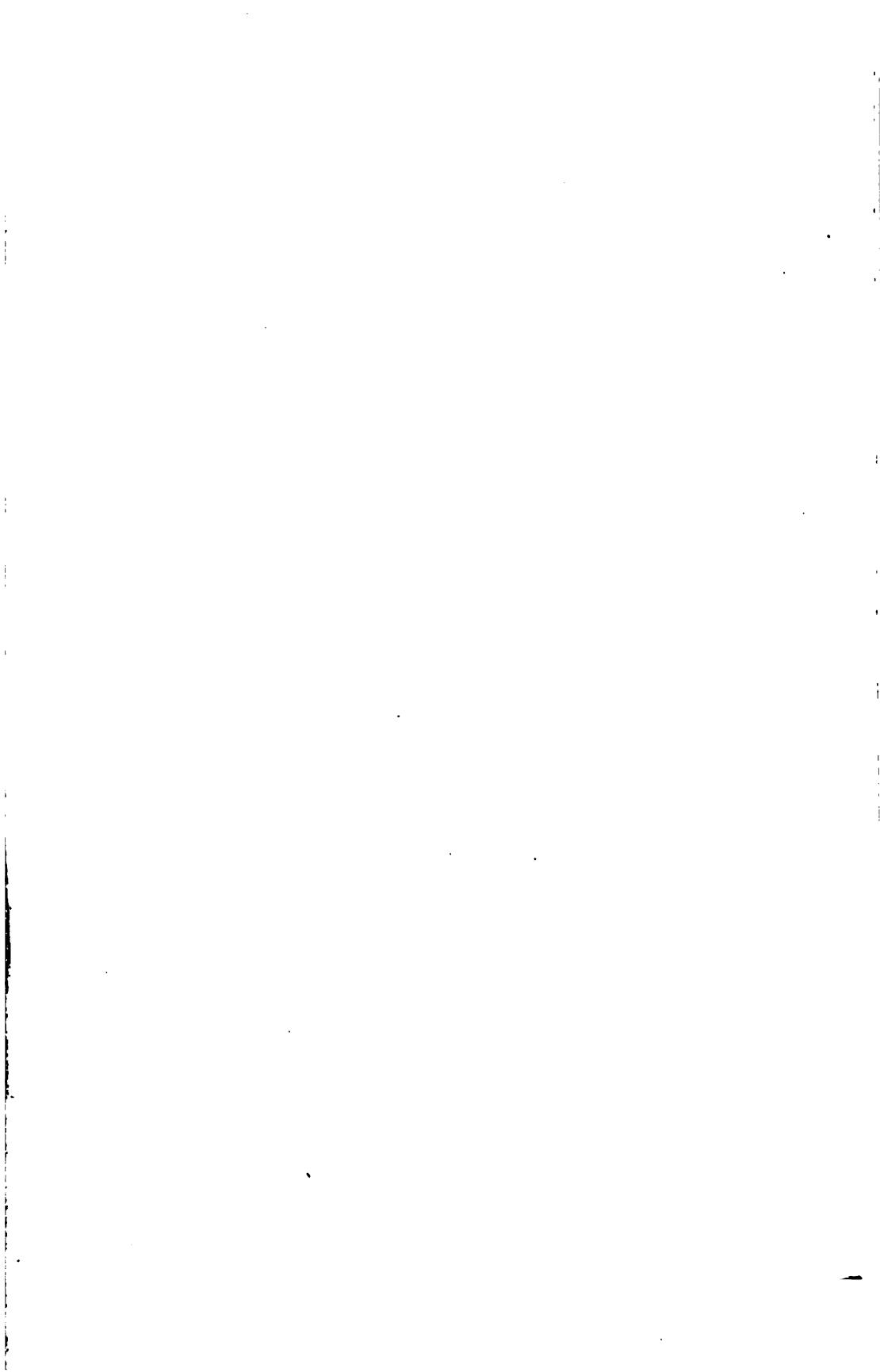
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# PROGRESSIVE MEDICINE.

A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES,  
AND IMPROVEMENTS

IN THE

## MEDICAL AND SURGICAL SCIENCES.

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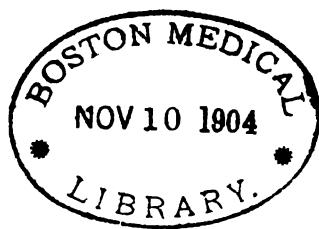
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SURGERY OF THE ABDOMEN, INCLUDING HERNIA—GYNECOLOGY—DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE SPLEEN, THYROID GLAND, AND LYMPHATIC SYSTEM.—OPHTHALMOLOGY.



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# PROGRESSIVE MEDICINE.

JUNE, 1904.

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## SURGERY OF THE ABDOMEN, INCLUDING HERNIA.

BY WILLIAM B. COLEY, M.D.

### HERNIA.

**Radical Cure of Umbilical Hernia.** J. Collins Warren,<sup>1</sup> of Boston, publishes some very valuable data as regards the possibility of effecting a permanent cure of large umbilical hernia by operative treatment. In many of his cases the hernia was of extremely large size and in patients usually regarded as most unfavorable for operative cure, as shown by a careful report of fourteen cases, with several photographic illustrations.

In view of the principle that the vertical diameter of the opening in these cases is always shorter than the transverse, Warren believes that better results will be obtained by bringing the lower and upper margins of the ring together, rather than the lateral edges.

Warren uses silk for his buried sutures.

His first operation was for a recurrent umbilical hernia in a patient aged forty-six years. The second operation was performed in December, 1890. The aponeurosis was sutured transversely with silk. The patient was examined by Dr. Warren in 1900, ten years afterward, and the result was found to be perfect. The patient has worn a belt since operation.

Of eleven cases operated upon by this method, in only one case was a recurrence reported during periods of one to thirteen years, giving a record of about 9 per cent. of recurrence after operation—certainly a very satisfactory result in such an unfavorable class of cases.

Further evidence as to the value of the overlapping method in the treatment of umbilical hernia is brought out by Dr. W. J. Mayo.<sup>2</sup>

<sup>1</sup> Boston Medical and Surgical Journal, October 8, 1903.

<sup>2</sup> Journal of the American Medical Association, July 25, 1903, p. 225.

The principles of closure by this method, according to Mayo, are the same as those after an ordinary abdominal section, the object being to split the fascia at the ring margins laterally until the recti muscles are reached, and then, by a series of buried sutures, to reconstruct the abdominal wall in layers. To bring the recti together above the umbilicus amounts practically to a muscle transplantation.

FIG. 1.



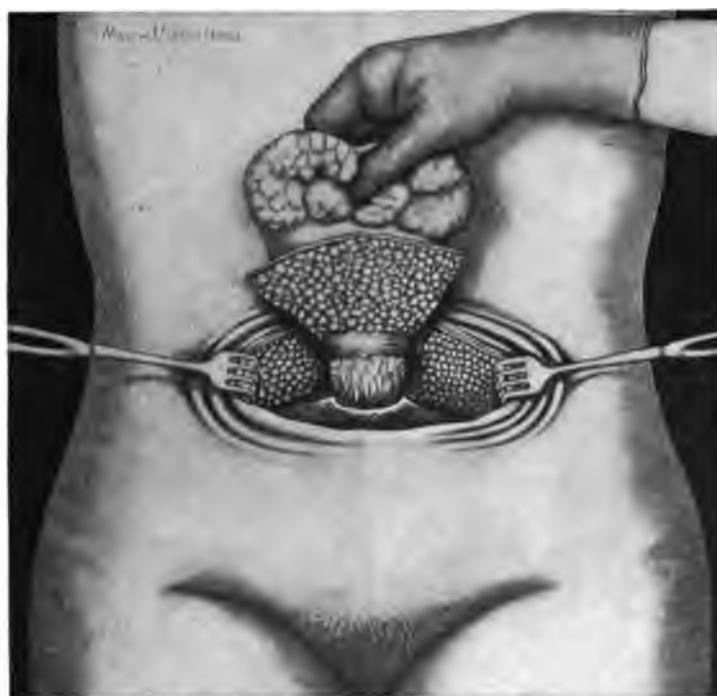
Lipomatosis dolorosa and hernia. (WARREN.)

In October, 1898, Mayo advocated the overlapping of the aponeurotic structures which were already at hand, securing a wide area of adhesions in place of edge-to-edge union. This method he had then employed in five cases ; in three the overlapping being from side to side ; in two from above downward. He states that the first of these overlapping operations was done in 1895, and that up to the present time he has performed this operation thirty-five times, overlapping from

side to side ten times, from above downward twenty-five times, with no deaths. The operation from above downward has been found so much easier that it is now employed to the exclusion of the side-to-side operation. He states that most of these cases have been recently examined, and thus far only one relapse has been observed. The steps of the operation are given at length.

The value of transverse closure of the opening in umbilical hernia seems to have been first appreciated by Dr. J. Collins Warren.<sup>1</sup> The

FIG. 2.



Transverse elliptical incision surrounding umbilicus and hernia. Circular incision dividing peritoneal and fibrous covering of hernia. (MAYO.)

results in his series of eleven cases, already referred to, compare favorably with those of Mayo, in which the feature of overlapping was added to that of transverse closure.

**Silver-wire Filigree for the Repair of Defects in the Abdominal Wall.** Willard Bartlett,<sup>1</sup> of St. Louis, calls further attention to the methods introduced by A. M. Phelps and Willy Meyer for repairing large openings in the abdominal wall by means of silver-wire filigree.

<sup>1</sup> Annals of Surgery, July, 1903.

Bartlett has devised a new form of filigree which he thinks is superior to any that has been hitherto used. He believes that the net used by Meyer possesses more stiffness than is desirable. His own filigree depends for its efficacy upon the fact that all but one of its wires are run across the long axis of the scar and penetrate for a distance of one to two inches between the tissue layers, "where they are firmly anchored, not by sutures, which I consider perfectly useless in this connection, but by newly formed scar tissue."

FIG. 3.



Entire sac with contained omentum removed. Incision through aponeurotic and peritoneal structures of ring, extending one inch or less to each side. Peritoneum separated from under surface of upper flap thus formed. Two to two-and-one-half inches above margin of upper flap three or four mattress sutures of silk are introduced, grasping upper margin of lower flap. (MAYO)

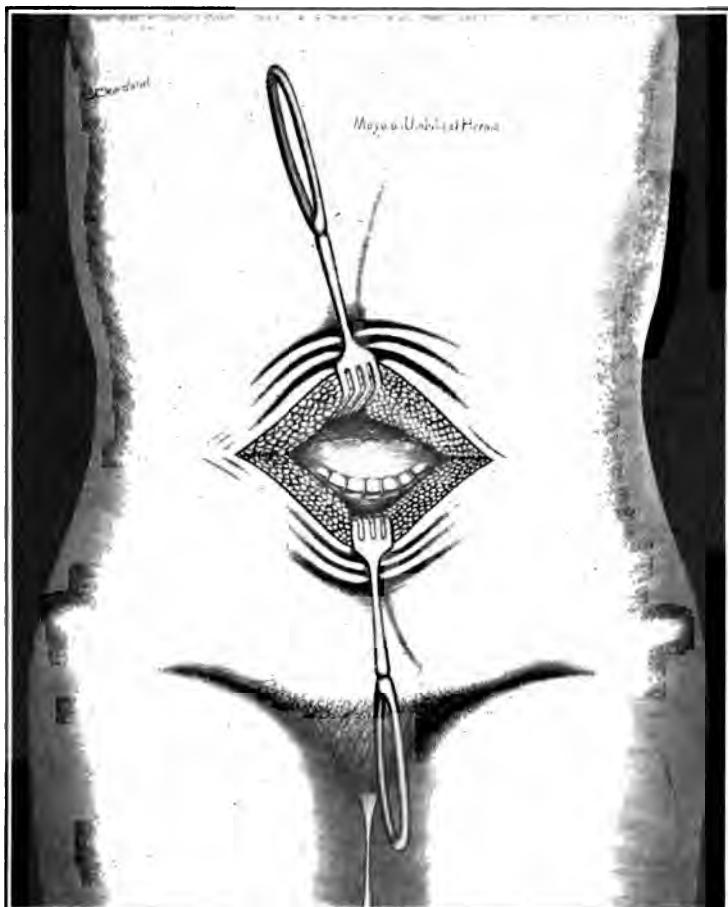
Bartlett's form of filigree is, doubtless, much more pliable than the net devised by Meyer. At the same time, neither Meyer's cases, which we commented on in our last article in PROGRESSIVE MEDICINE, in June, 1903, nor Bartlett's seven cases, reported in his article, furnish conclusive evidence as to the value of the methods advocated.

After relating in detail seven cases operated upon by his method, Bartlett concludes : "It will be seen from the foregoing that I have done this comparatively new operation seven times, and seen uniformly perfect results in all but one case. Here the slight partial bulging,

which resulted under the influence of an ascitic collection, was in no sense the fault of the method, but due, on the other hand, to a technical flaw."

An analysis of these seven cases, however, shows that in the first case the filigree was used to repair a weakness in the lumbar region of

FIG. 4.



Mattress suture drawn into position, sliding entire lower flap into pocket previously formed between aponeurosis and peritoneum above. Free margin of upper flap is fixed by catgut sutures to surface of aponeurosis below. (MAYO.)

the abdominal wall after removal of a large sarcoma in a child aged three and one-half years. The child died three and one-half months after the operation—a time manifestly much too short to determine the permanency of a cure.

Another case was that of a girl, aged eighteen years, in which there was a large thin scar after a suppurative appendicitis operation and a large opening in the abdominal cavity. In this case the patient was apparently very much improved, though the latest time of observation was nine months after operation.

Such cases as this, especially in a person so young, can be perfectly well cured by a simple operation, consisting in removal of the scar and suturing the parts in layers. In proof of this I will mention a case, far worse than the one just mentioned, in which there was a hernia the size of a child's head, following an appendicitis operation, and in a woman aged forty-five years. The patient was operated upon by Dr. W. T. Bull seven years ago by the method suggested. She has led an active life since, and there is not the slightest sign of weakness at the present moment.

In a third case the filigree was used for a hernia following appendicitis in a man aged fifty-five years. The patient was well at the time of the last observation, eight months after operation.

A fourth case was a large umbilical hernia accompanied by cirrhosis of the liver, with much ascites. A filigree  $5 \times 2\frac{1}{2}$  inches was inserted behind the recti muscles. Eleven days after the operation the patient had a sudden attack of nausea, and expired in ten minutes. No autopsy was obtained.

In a fifth case the filigree was used to overcome a defect in the abdominal wall in the iliac region, caused by the removal of a carcinoma from the groin. The size of the defect, it is stated, was one inch broad by three inches long. The patient, however, died of general carcinosis five months after operation.

In a sixth case the method was used for a small hernia associated with cirrhosis of the liver, with ascites, occurring in a middle-aged man. In this case the sac was dissected out, the recti and sheaths freely exposed, but the peritoneum not opened. A filigree  $2 \times 4$  inches, of aluminum-bronze wire, was inserted upon the floor of the wound.

This case was observed two years after operation, at the end of which time there was a bulging area, about the size of half a walnut, at the upper part of the cicatrix. The original hernia was stated to be small, the exact size not being noted, so we cannot compare the size of the recurrence with that of the original hernia. It is stated that the portion where the hernia recurred was beyond the filigree, and in an area where small coils of wire fashioned after the manner described by Phelps were used. At this point the wound broke down as soon as the patient got out of bed.

In a seventh case the filigree was used in a colored woman, aged twenty-two years, who had been kicked in the groin two months before.

It is stated that she had noticed a bulging at the site of the injury which corresponded fairly well to the inguinal canal, with a pronounced impulse on coughing, and that, although there was no pronounced hernia, an operation was believed to be necessary, and was performed on February 28, 1903. After splitting the aponeurosis the muscle in the posterior wall of the inguinal canal appeared to be much thinned out, so that no attempt was made to use it in closing the opening, and a wire filigree was fastened to the floor, and over this the aponeurosis was sewed with continuous silver wire. The size of the filigree was two and one-half inches broad by three and one-half inches long. The wound healed by primary union, and at the end of two weeks the patient was up and about. This patient was traced only for four months beyond the period of operation.

These cases, taken as a whole, seem to me distinctly lacking in proof that the introduction of wire filigree of any sort gives us any better results than other methods that are free from its objections. To use such a method in a case like the one last referred to, namely, in a young woman, aged twenty-two years, with an incipient inguinal hernia, seems to me extending its scope far beyond the limits proposed even by the men who believe in it under certain conditions. Inguinal hernia in the female, even of large size, is the easiest to cure of all varieties of hernia, by the simple method of Bassini. I have personally operated upon over two hundred cases of inguinal hernia in the female, and have carefully traced these cases, some of them beyond ten years, without a single recurrence.

Hence, I think it extremely unwise to advocate the introduction of a foreign body, like the wire filigree, into the abdominal wall for such a condition. The disadvantages of buried non-absorbable sutures of any kind have been frequently pointed out in PROGRESSIVE MEDICINE. Two years ago I referred to one of Phelps' own cases, in which the silver wire subsequently formed sinuses which remained open for nearly a year, and were closed finally only by the complete removal of the wire. Yet the thinning and weakening of the canal, owing to the long-continued suppuration, caused a recurrence of the hernia several times the original size, making it impossible either to control it with a truss or even to undertake a second operation.

This and other similar cases have convinced me that it is unwise to introduce a foreign body in the cure of any variety of hernia, provided that as good or better results can be obtained without the dangers attending such methods.

**Statistics on Hernia.** A recent paper by Otto Pott,<sup>1</sup> entitled "A Contribution to the Prognosis of the Radical Operation for Hernia,"

<sup>1</sup> Deutsche Zeitschrift f. Chirurgie, November, 1903, p. 556.

comprises most valuable statistical material on the subject in question. Pott divides his paper into three parts:

In Part I. he describes the purpose of collective statistics of this kind. He believes that an operation like the one under consideration, that has become or should be the common property of all surgeons, should be judged by the average results obtained under different conditions, and not by the results obtained by a single man, since only in this way can the most important questions, those regarding the danger and value of the operation, and the best method to be used, be properly answered.

Part II. comprises a brief survey of the material used by him, covering the results of 151 operators, beginning with Leisrink's report, which included the operations performed by the various surgeons, up to 1883.

In Part III. of his paper Pott gives the results of his researches, and submits the following data:

These figures show the mortality of all radical operations for hernia thus far performed to be nearly 1 per cent., 0.9 per cent. being the greatest in ventral hernia, while in inguinal hernia it is about the same as the general mortality. The total mortality for the last seven or eight years is far more favorable, being but  $\frac{1}{2}$  of 1 per cent.; the operations for femoral hernia showing the greatest number of deaths; for inguinal hernia the mortality is  $\frac{2}{3}$  of 1 per cent., instead of almost 2 per cent. in the first two decades of modern surgery.

These results, compared to the mortality of 6 per cent. in pre-antiseptic times, as reported by Wood, speak well for the present high standard of operative surgery, and Pott states we may well look upon the radical operation for hernia as almost free from risk.

As regards the permanent results—*i. e.*, sound at least two years after operation—Pott's statistics show 82 per cent. for inguinal hernia, 70.5 per cent. for femoral hernia, and 55 per cent. for ventral hernia. The results in children (up to fourteen years), including all varieties of hernia, were 560 permanent cures, 84 relapses, 4 doubtful—96.4 per cent. In individuals over fifty years of age there were 259 permanent cures, 173 recurrences, 10 doubtful—58.6 per cent.

With regard to the question as to the best methods, Pott's statistics show Kocher's transplantation method and Bassini's method about equally efficient, and superior to all other methods. In this connection it should be mentioned that Kocher's methods are distinctly not intended for all varieties of inguinal hernia; furthermore, the operations reported were performed by comparatively few operators. The efficiency of the invagination transplantation method should be proved by a greater number of operations.

The same is true of Kocher's method, whose 95.6 per cent. of permanent cures signify little in view of the small total number of operations.

In femoral hernia, ligature and extirpation of the sac and suture of the mouth of the hernial ring have given the best results—76.5 per cent.

**Strangulated Hernia in Children under One Year of Age.** A case of strangulated hernia in an infant twenty-seven days old is reported by Reid,<sup>1</sup> of Rome, N. Y. He states this is the youngest case operated upon by an American surgeon since the aseptic era. This is not entirely accurate, as several cases under three weeks of age have been operated upon by New York surgeons. A year ago in PROGRESSIVE MEDICINE, June, 1903, I reported a case of my own, aged thirteen days, operated upon two years ago. The patient made an excellent recovery.

The most complete statistics on strangulated hernia in infants are those of Estor,<sup>2</sup> given in considerable detail in my article in PROGRESSIVE MEDICINE a year ago. Estor found 169 cases operated upon during the first year of life. I have personally operated upon eleven cases under the age of two years, with one death. Of these, six were under one year of age, the remainder between one and two years.

**Hernia of the Bladder.** The rarity of hernia of the bladder associated with inguinal hernia is emphasized by H. J. Curtis.<sup>3</sup> Curtis states that in the period from 1898 to 1900 only one case was observed at the University College Hospital, London. This was successfully operated upon by Mr. Milton Pollard.

The accompanying diagram (Fig. 5) shows very clearly the appearance of this condition, and ought to be of service in preventing the accident which so often attends these operations, namely, of cutting into the bladder before recognizing it.

**Results of Operation for Strangulated Hernia.** A recent paper by Weyprech<sup>4</sup> on the "Experience with Operation for Incarcerated Hernia," contains some very valuable statistical data, covering the observations made within the ten years from June 10, 1890, to June 10, 1900, at the City Hospital on the Urban, Berlin, from the clinic of Prof. Körte.

Herniotomy was done in 327 out of 402 cases that applied for treatment; in 70 the hernia was reduced without surgical intervention;

<sup>1</sup> New York State Journal of Medicine, 1903.

<sup>2</sup> Revue de Chirurgie, 1902.

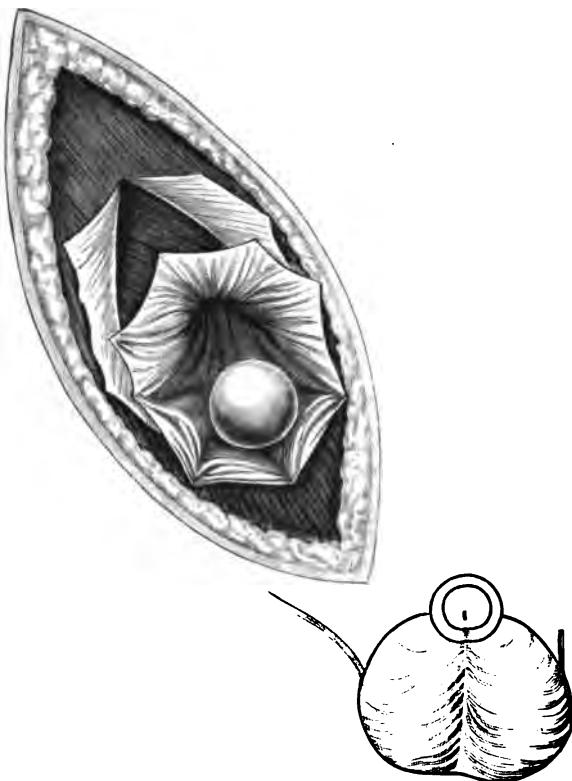
<sup>3</sup> British Medical Journal, July 11, 1903, p. 69.

<sup>4</sup> Archiv f. klin. Chirurgie, No. 1, Band lxxi.

4 reached the hospital in a moribund condition, so that no operation could be undertaken ; in a fifth case a small strangulated femoral hernia had been overlooked, and the patient died without operation being performed. Deducting the latter there remains 397 incarcerated herniæ treated at the hospital, with 57 deaths, or a mortality of 14.4 per cent.

In 73 of the 327 cases operated upon gangrene was present. Weyrecht, quite correctly, places the gangrenous and non-gangrenous cases in two separate categories in the consideration of results.

FIG. 5.



Semidiagrammatic, prepared from a sketch at Mr. Pollard's operation for radical cure of a right inguinal hernia, into the back of the sac of which a protrusion of the bladder was found bulging.

He calls attention to the great danger of long-continued and especially forced taxis, and emphasizes the fact that in the absence of gangrene the risk of operation is very small.

Of the 254 cases of non-gangrenous hernia that were operated upon, 230 (90.6 per cent.) were cured and 23 (9 per cent.) died ; 1 patient left soon after operation, and was not heard from again.

Of the 73 cases in which gangrene had set in, 39 (53.4 per cent.) were cured and 34 (46.6 per cent.) died.

The total mortality after operation was 17.4 per cent.

As regards the two sexes, it is stated that 101 were men, 226 women. Gangrene was present in 12 of the male and 61 of the female cases.

Classifying the frequency and mortality of all operations according to the age of the patients, Weyprecht reports :

7 cases ( 5 m., 2 f.),	up to 6 months,	with 2 deaths = 28.6 per ct.
6 " (all males ),	6 mos. to 10 yrs.,	without mortality.
61 " (30 m., 31 f.),	11 yrs. to 40 yrs.,	with 2 deaths = 3.26 per ct.
250 " (60 m., 190 f.),	41 yrs. to 80 yrs.,	with 52 deaths = 20.8 per ct.
3 " (all females ),	over 80 years,	with 1 death = 33½ per ct.

It is interesting to note that in the first six months of life the number of cases operated upon was greater than in the following ten years. The fifth decade showed the largest number of herniotomies—81, with 12 deaths, or 14.8 per cent.

Up to the thirtieth year the number of male patients is by far greater than that of the female, 29 to 7; while after the thirtieth year the number of women operated upon greatly exceeds that of the men, being almost three times as large.

The death-rate after operation in infants is very high, and is surpassed only by the mortality in patients over seventy years. I do not believe that the death-rate in infants should be very high. I have operated upon eleven cases under two years of age, with but one death, and that in a patient nearly moribund at the time of operation.

As regards the different varieties of hernia and the separate mortality of each after operation for strangulation, the following figures are of interest :

Variety.	Male.	Female.	Total.	Mortality, including gangrenous hernia.
Inguinal . . . . .	77	36	113	14.0 per ct.
Femoral . . . . .	19	174	193	18 1 "
Umbilical . . . . .	3	11	14	14.3 "
Umbilical cord . . . . .	2	1	3	66.6 "
Obturator . . . . .	...	2	2	50.0 "
Ventral . . . . .	...	2	2	50.0 "
	101	226	327	18.0 "

From this it will be seen that while incarcerated femoral hernia was observed far more frequently in women than in men—174 against 19, inguinal hernia occurred twice as often in men as in women—77 to 36.

It is further stated that the right side was the seat of incarceration in 71 inguinal and 133 femoral herniae; the left in 42 inguinal and 70 femoral, which proportions do not bear out the assumption of Henggeler and others, that the preference for the right side has reference to femoral hernia only.

Ninety-two, 28 per cent., of the patients had worn a truss, while 42, 12.8 per cent. were not aware of the presence of a hernia until strangulation occurred.

Strangulation of two herniæ in one person was observed once.

Only 157 of the 254 cases of non-gangrenous hernia were operated upon within the first forty-eight hours after strangulation; 33 on the third day; 64 after the third day. The duration of incarceration always had an unfavorable effect upon the result of operation.

With reference to the contents of the hernial sac, omentum alone was found 37 times—*i. e.*, in 17 of the inguinal and in 20 of the femoral. A loop of small intestine alone was found in 126 cases. Several loops of intestine were found in 7 cases; Meckel's diverticulum twice; small intestine and omentum in 5 cases; large intestine once; large and small intestine six times; large intestine and omentum twice; large and small intestine and omentum once. Appendices epiploicæ caused strangulation in 4 cases. The vermiform process had become incarcerated in 12 cases.

The observation made, that cases in which the appendix forms the contents of the hernial sac are generally congenital was not confirmed in the cases here reported. Nine of these patients were over fifty-seven years of age, and in all the hernia had been acquired late in life.

As to complications and causes of death, the report states that in 175 cases the patients made an uninterrupted recovery; in 32 complications arising from the respiratory organs were noted, with 5 deaths.

Peritonitis was the cause of death in but 1 of the 23 fatal cases, and this, Weyprecht states, might have been avoided had the condition of the loop of intestine been properly judged.

In the great majority of the cases Weyprecht is of the opinion that death occurred not as a result of the operation as such, but in consequence of concomitant and unavoidable bodily conditions.

As regards gangrenous hernia, it appears that in about one-fifth of the entire number of cases that were sent in for treatment gangrene had already set in—a most deplorable state of affairs, considering that the mortality percentage of operation in the presence of gangrene proved to be more than five times as large as that in the non-gangrenous cases.

According to Peterson, of 309 incarcerated herniæ observed at the Heidelberg clinic between 1877 and 1900, 52, or about one-sixth, were gangrenous. Cohn reports 31 cases of total gangrene of intestine in a series of 220 herniotomies done at Friedrichshain from 1880 to 1888. Henggeler mentions 44 gangrenous cases in 276 incarcerated herniæ operated upon at the Zurich clinic; v. Bramann (Halle) reports 68 of 248 cases gangrenous; Hofmeister (Tübingen clinic) 25 in 64

herniotomies performed for incarcerated hernia. No comparisons can be drawn between these figures, however, since some authors include all incarcerated herniae, while others count only those in which herniotomy was performed.

Mikulicz, in 1892, ascertained, on a basis of the results of seven surgeons, that of 168 gangrenous herniae 109, or nearly two-thirds, resulted in death. Hofmeister, who continued these statistics, found, in 1900, 101 deaths in 167 cases, being a mortality of 60.5 per cent.

Regarding the contents of the hernial sac in the gangrenous cases, Weyprecht states that the small intestine alone was found 52 times; small intestine and omentum in 15; omentum and large intestine, omentum, large intestine and small intestine, small intestine and bladder in 1 case each. The vermiform process was found three times.

The cause of death in the fatal cases is shown to be as follows:

Pre-existing peritonitis . . . . .	12 times.
Peritonitis occurring later . . . . .	9 "
Tuberculous peritonitis . . . . .	1 time.
Pneumonia . . . . .	3 times.
Collapse, shock . . . . .	7 "
Phlegmon . . . . .	1 time.
Vesical diphtheritis and pericystitic abscess . . . . .	1 "

Primary resection of intestine is looked upon as the normal procedure. The establishment of an artificial anus is resorted to only in exceptional emergencies.

One of the recent numbers of the *Deutsche Zeitschrift für Chirurgie*, vol. lix., Nos. 5, 6, contains some very interesting data regarding incarcerated hernia. The authors, Ernst Fuchsigt and Emil Haim, report 175 cases of strangulated hernia observed at the Franz Josef Hospital, Vienna, between June 1, 1893, and January 1, 1903.

As to the different varieties of hernia, it is stated that 97 (55.4 per cent.) were inguinal; 62 (35.4 per cent.) femoral; 14 (8 per cent.) umbilical, and 1 each obturator and ventral hernia (0.6 per cent.).

From a chart presented in the paper it appears that the number of cases of inguinal hernia is pretty nearly the same in the various decades from twenty to sixty years of age, showing that strangulation is most likely to occur during the period of work, while in the first two decades congenital predisposition, in the latter two, gradual decrease of elasticity, and resisting power of the tissues come into consideration. As a further proof of the influence of manual labor as a causative factor may be mentioned that all of the 6 cases between the ages of eleven and twenty years were past fifteen years. After sixty the decrease is very rapid. Of the 5 cases in the first decade 4 were below three years, 1 nine years of age, which would seem to show that in the presence of a con-

genital hernial sac incarceration occurs either in the first year or a good deal later, after the influence of bodily exertion has made itself felt.

The presence of a congenital hernial sac could be positively proven in 17 of the cases of inguinal hernia, but was probably considerably more frequent.

Femoral herniae were comparatively most frequent between the ages of forty and seventy years.

The general experience of the preponderance of male cases in inguinal (97 to 7) and of female in femoral and umbilical (62 to 5 and 14 to 1 respectively) herniae is again confirmed by Fuchsig and Haim's statistics.

Incarceration was noticed on the right side in 63 per cent. each of the inguinal and femoral herniae.

Thirty-six patients stated that they had been wearing a truss, which shows that for the working classes a truss is inefficient, inasmuch as these people are not in a position to always have a perfectly fitting truss, and any other is worse than none.

The authors advocate the use of a truss only in children with comparatively small herniae, and possibly in old patients whom it does not seem wise to subject to an operation.

In the great majority of the cases strangulation was primary, although in 20 inguinal, 7 crural, and 4 umbilical, repeated incarcerations had preceded the patient's admission to the hospital. In only 2 of these (both umbilical) had a radical operation been previously performed.

The danger of incarceration was found to be greater in femoral than in inguinal hernia.

As regards the treatment, it is stated that 37 cases were cured by taxis. This was at a time when the question of taxis or immediate operation had not yet been decided in favor of the latter. On the basis of their present experience they are decidedly opposed to taxis, which they would attempt only within the first twelve hours after strangulation, and then only in cases in which operation seems contraindicated. In 135 cases operation was performed, and in the majority of the inguinal herniae Bassini's operation was employed. If the intestine was above suspicion it was replaced, and the radical operation added. The cord was transplanted either according to Ferrari or Bassini. The former method proved especially commendable in large herniae.

Primary resection of the intestine was done 13 times, with a mortality of 54 per cent. (7 cases). Of two patients in whom secondary resection was done 1 died, the other was cured.

Post-mortem examination showed peritonitis to have been the cause of death in all the fatal cases of resection.

Suppuration was noticed 16 times in the cases that recovered (12 per cent.). Most of these were stitch-hole suppurations, and these have decreased considerably since the introduction of aluminum-bronze wire for the Bassini sutures.

As regards the total mortality, the statistics show 35 deaths in 170 cases—20 per cent.

Of these, 135 were operated upon, with 32 deaths—23.7 per cent.

Of the 37 cases in which taxis was employed 1 died. Three patients refused operation.

Considering the different varieties of hernia separately, there were 70 cases of inguinal hernia operated upon, with 12 deaths—17.1 per cent.; 51 crural herniae, with 12 deaths—23.5 per cent.; 13 umbilical hernia operated upon, with 7 deaths—53.8 per cent. The case of obturator hernia also resulted in death.

Autopsy showed that death was due to peritonitis in the majority (28) of cases. The death-rate was highest in the umbilical, lowest in inguinal hernia, being 53.8 per cent. in the former, 17.1 per cent. in the latter.

**Undescended Testis and Hernia.** A further contribution to the surgical treatment of undescended testis associated with a hernia was made at the meeting of the American Medical Association in 1903 by Bevan,<sup>1</sup> of Chicago. He divides undescended testes into four types: (a) in the abdomen, in about its original position; (b) at the internal ring; (c) in the canal; (d) external to the external ring. He states that undescended testis occurs in about one to five hundred individuals, as shown by the statistics of the Austrian army.

Bevan calls attention to the fact that in the standard text-books of to-day almost no mention is made of the condition or its treatment, the idea generally prevalent among medical men being that nothing can be done to cure the condition except removal of the testis. The rule that Bevan lays down is to operate and transplant to its normal position in the scrotum every undescended testis which can be palpated. Those that cannot be palpated should be operated upon if they give rise to symptoms or are complicated with hernia. In other words, he would operate upon practically all cases of undescended testis.

The operation which Bevan proposes for the condition is practically the same, as far as closure of the abdominal wall is concerned, as Bassini's method without transplantation of the cord. As regards the treatment of the testicle itself the main points are: (1) Cut across the tunica vaginalis sufficiently high up to leave enough tunica to close, by means of purse-string suture, over the testis. (2) The cord is then

<sup>1</sup> Journal of the American Medical Association, September 19, 1903, p. 718.

stripped from the sac beyond the internal ring, almost the length of a finger down into the pelvis. When the cord has been freed in this manner it is found to be much elongated, and can in most cases, according to Bevan, be brought down into the scrotum. This dissection of the cord from the peritoneum in the iliac fossa is a blunt dissection, and should be done most carefully. Bevan states that the cord should be so lengthened by these manœuvres that the testicle can be placed on the thigh three to four inches below Poupart's ligament. (3) The next important feature of Bevan's method is a purse-string suture placed at the entrance of the scrotum, just outside of the external ring, to retain the testicle in position. This suture is passed through the superficial fascia and external oblique on both sides of the incision.

At the Hospital for Ruptured and Crippled we have always advocated operation for hernia associated with undescended testis in children approaching the age of puberty, and during the past fourteen years have a series of fifty cases in which operation was performed for this condition. We have, however, never gone so far as to urge the operation in all cases of hernia associated with undescended testis in children, for the reason that in many cases in children under eight to ten years the testis comes down spontaneously before the age of puberty. We have carefully traced the results of operation in these cases, and thus far we have never observed a recurrence of the hernia, but in some cases, years afterward, the testis has been found just outside of the external ring, smaller than the other, there having evidently been no material development since operation. In other cases the testis has remained in the scrotum, and is apparently of normal size. Full details of these cases will soon be published by Dr. Bull and myself.

I believe there is a decided risk of hemorrhage from tearing the veins in carrying out the blunt dissection of the cord from the peritoneum in the iliac fossa, no matter how carefully performed. If some of the large veins should become ruptured in that position, serious hemorrhage may ensue, and it would be most difficult to control such hemorrhages.

The method that we have ourselves followed has been practically the same as Bevan's, without quite such extensive dissection in the iliac fossa.

In an article on "Cryptorchism," Riedel<sup>1</sup> briefly cites the various methods recently proposed of anchoring an inguinal testicle in the scrotum.

Hahn makes an incision  $1\frac{1}{2}$  cm. in length into the deepest portion of the scrotum, pulls the testicle through this opening, and allows it to remain outside, partly closing the incision by buttonhole sutures. Seven days later the testis is returned into the scrotum.

<sup>1</sup> *Archiv f. klin. Chirurgie*, Band lxxi., No. 2.

Katzenstein follows the same method in the treatment of undescended testis, but covers the exposed testis with a skin-flap from the inner upper thigh. This skin-flap is later severed at its base and embodied in the scrotum.

Longard does not push the testis through the incision in the lower part of the scrotum, but fixes a small segment of the same in the incision by a few sutures, catching skin of scrotum and tunica at the same time. The sutures are left long and fastened to the interior surface of the upper thigh by means of adhesive plaster.

If the anchoring of the testis in the scrotum causes difficulty, Riedel states, any one of these methods might be used to advantage. In his own cases, however, the difficulty lay merely in the immovability of the testis. As soon as it was rendered freely movable fixation in the scrotum could be accomplished without trouble. He states that this immovability of the testis was not due to tension of the cord, but to inelasticity of the vas spermatica, which latter had to be freed from the cord and, retroperitoneally, high up in the pelvis, to permit of sufficient tension.

This extensive freeing of the vas spermatica Riedel believes to be the most important feature of the operation in the majority of cases. The vas deferens did not cause any trouble in his own six cases reported.

In his first case, a boy aged sixteen years, the testis is stated to have remained in its normal location when last heard from, three and one-half years after the operation, and the patient was in good health.

Examination of the second case, a boy aged thirteen years, a little less than three years after operation, shows the testis somewhat smaller than normal, and slightly drawn up.

Case 3 was a boy aged twelve years, with double hernia associated with undescended testis on both sides and complete atrophy of scrotum (patient demented); was operated upon for the hernia only.

Case 4 was eight years of age; right testis in inguinal canal, highly atrophic; left testicle almost descended. Present condition, two years after operation: right testis occupies normal position, and, while it was atrophic before, it is now as large as the left.

Case 5 was nineteen years of age; right testis somewhat smaller than left, situated, as a rule, just below the external ring. The report, four and one-half years after operation, states the man has served in the army for nearly two years, and has always been healthy; right testis is in scrotum, half as large as the left. Hernia cured.

Case 6 was twenty-three years of age; strong man; complete cryptorchism on right side; large inguinal hernia on left side. As right testis could not be found on operation, great care had to be

exercised not to injure the left. Examination four years after operation shows the man in good health. He is married, and has three children.

All of Riedel's patients were permanently cured of their hernia, although three are making a living by hard labor. None was operated upon according to Bassini.

### THE ABDOMINAL WALL.

**Closure of the Abdominal Wound.** Higgins<sup>1</sup> believes the best results in closing an abdominal wound are obtained by a combination of mass and layer sutures. He first introduces three or more mass sutures, but does not tie them. Next he sews the peritoneum with fine catgut, the fascia with chromicized catgut, and the skin with a subcuticular stitch of horse-hair or fine silkworm-gut.

The wound is then covered by a narrow pad of gauze, and the mass sutures are tied over a thin metal or celluloid strip. Small pads of bichloride gauze are slipped under the ends of the strip to protect the ends of the abdominal wound. A light outer dressing is applied. This metal strip prevents the mass stitches from cutting through the skin and leaving scars.

Baldwin<sup>2</sup> believes that he has perfected a method of closing the abdominal wound so that hernia will never result. At least he has not had hernia follow suture in over one thousand laparotomies. The chief point in his method is the exact approximation of the fascial edges so that no muscular or fatty tissue intervenes. The incision is made in the median line. The fascia is carefully cleaned of fat before it is incised. When the time for closing the wound arrives, through-and-through sutures of silkworm-gut are inserted, catching the edge of the peritoneum, but reaching rather far back through the muscle, fascia, and skin. Before these sutures are drawn up Baldwin inserts an over-and-over stitch of annealed tinned iron wire through the edges of the fascia, bringing the ends of the wire out through the skin, drawing the wire tight without kinking, and then fastening each end through a gauze pad with a perforated shot. This wire is not threaded on a needle, but is drawn after a needle doubly threaded with cotton or silk in the usual manner. The silkworm-gut stitches are then tied. In ten days the silkworm-gut stitches and the wire stitch are clipped short at one end and withdrawn. The patient wears a bandage for three months. This tinned annealed iron wire is more flexible and has

<sup>1</sup> Boston Medical and Surgical Journal, 1903, vol. cxlix. p. 645.

<sup>2</sup> Annals of Surgery, 1903, vol. xxxviii. p. 664.

greater strength than other wires used for suture. It can be bought on spools at a hardware store.

**Suppuration in Abdominal Wounds.** Darnall<sup>1</sup> says that suppuration sometimes occurs in the abdominal wall, even when every possible precaution has been taken to preserve the vitality of the tissues. It may generally be attributed to rough handling or bruising of the fatty layers by instruments, carelessness in checking hemorrhage, the introduction of infection by skin sutures. If the abscess is superficial it will heal in a few days. If it is deep down between the muscles and peritoneum it may be mistaken for intra-abdominal suppuration in the pedicle of the tumor, for instance. In such circumstances the pus usually spreads throughout the whole wound, and all the stitches must be removed. Instead of allowing such a wound to heal by granulations it should be cleansed and lightly curetted and drained by a narrow strip of gauze. The edges of the wound should then be brought together over the drain by means of zinc oxide plaster. A good way to use the plaster is to stick a strip to the skin on either side of the wound, and then to suture the two strips together.

**Penetrating Wounds of the Abdomen.** Gebele<sup>2</sup> advocates immediate exploration of penetrating wounds of the abdomen received in civil life. If the surgeon waits for symptoms of hemorrhage or perforation the favorable time for operation will generally have passed.

This advice is in accord with the best American practice. Intestinal wounds should be sutured. Damaged intestine should be resected, and the gap in the bowel closed by suture or by Murphy's button. Hepatic wounds will stop bleeding when sutured with catgut. The spleen may be sutured, but if it is badly damaged it should be removed.

## THE PERITONEUM.

**Talma's Operation for Ascites.** Allyn<sup>3</sup> reviews the reports of 125 operations intended to relieve ascites due to *cirrhosis of the liver*; 38 patients died within a month after operation, 35 were not improved by the operation, and 51 were improved by the operation. Like previous writers upon this subject, he believes that better results will be obtained if there is a more careful selection of cases. Some operators have reported a final cure obtained after several months' convalescence, during which repeated tappings were necessary until the collateral circulation was well established. Feebleness of the heart with chronic

<sup>1</sup> American Gynecology, 1903, vol. ii. p. 229.

<sup>2</sup> Münchener med. Wochenschrift, 1903, vol. I. p. 1415.

<sup>3</sup> American Medicine, 1903 vol. vi. p. 1017.

nephritis and extreme nervous symptoms are mentioned as contraindications to operation.

Harris<sup>1</sup> reports that 5 patients operated upon for alcoholic cirrhosis with ascites died within a month, and that 1 patient, in whom the cirrhosis was probably syphilitic, was alive five months after operation in an unimproved condition. These cases serve to strengthen his opinion that the congestion of the portal radicles is not the sole cause of the ascites, but the latter is due in part to chronic inflammatory changes in the peritoneum. Hence, any benefit derived from Talma's operation in alcoholic cirrhosis is likely to be only temporary.

**Treatment of Diffuse Peritonitis.** So long as disease is attended with a high mortality, just so long will interest attach to new methods of treatment. Unfortunately, these new methods do not always fulfil the promises made for them by their advocates.

While it is the duty of PROGRESSIVE MEDICINE to report all new suggestions that may contain a germ of truth, it is even more important for the average reader to know in how far these new ideas have won a place for themselves in actual practice.

These remarks apply with particular force to the treatment of diffuse peritonitis. No less than five papers read at the last meeting of the American Surgical Association<sup>2</sup> were devoted in whole or in part to this important subject. Space does not permit an extended review of each one, but a brief outline of the treatment advocated is given :

Blake divides cases of diffuse peritonitis into those in which the process is "spreading" without any limitations due to adhesions or gravity, and those in which it has already spread to the whole peritoneal cavity, excepting, perhaps, the lesser peritoneal cavity. The latter variety he designates as "general" peritonitis. He reports 17 cases of spreading peritonitis ; 10 of them were due to *appendicitis*. These 10 patients recovered ; 6 without and 4 with the use of drains. The peritonitis in the other cases was due to perforation of *gastric or duodenal ulcer* (2 recoveries, 2 deaths), *typhoid perforation* (1 death), *gonorrhœal infection* (2 recoveries). He reports also 15 cases of general peritonitis due to appendicitis 7 times (3 recoveries and 4 deaths) ; to typhoid perforation (1 recovery) ; to *tuberculous perforation* (1 death) ; to infection through the Fallopian tubes 6 times (1 recovery, 5 deaths).

Blake gives as the aim of treatment in these cases : first, the removal or segregation of the cause of peritonitis ; and second, the placing of the peritoneum in the best possible conditions to withstand and eliminate the generalized infection. He operates as soon as the patient can be prepared, believing that with the removal of the cause and the major

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xli. p. 1059.

<sup>2</sup> Transactions of the American Surgical Association, 1903, pp. 23 to 103

portion of the toxic effusion the peritoneum is placed in a much better position to eliminate and destroy the remaining infection. He has invariably cleansed the peritoneum with large quantities of decinormal saline solution at 110° F., introduced with a very large glass tube or from a pitcher, sometimes mopping up the surplus with gauze, sometimes leaving it in the peritoneal cavity, with no apparent difference in result.

What he says about drainage is given in full: "I was formerly a warm advocate of abundant drainage; later I became convinced of the utter impossibility of draining every part of the peritoneal cavity, for it was evident that the drains were soon isolated by adhesions; so I next confined myself to the drainage of the field of operation, and then, perceiving that the other similarly affected regions of the peritoneum took care of themselves, I omitted drainage almost entirely, and only employed it when the presence of necrotic tissues or hemorrhage demanded it."

The use of drains increases the formation of adhesions. Post-operative meteorism and vomiting are more often seen if drains are used. In the cases cited peritoneal abscesses forming during convalescence occurred four times. In two of these cases drains were used, and in the other two not. Sometimes he closes the peritoneum and drains the parietal wound. The average duration of convalescence in undrained cases was twenty-five days, and in drained cases forty-three days; or, considering only the cases due to appendicitis, the figures are twenty-two days for undrained and thirty-five days for drained cases. In the former group the temperature was normal in four days, and in the latter in eight days.

He concludes that the best treatment is:

1. Early operation.
2. Lavage of the peritoneum with large quantities of saline solution.
3. Closure of the peritoneum without drainage, unless the latter is absolutely indicated by the presence of non-absorbable amounts of necrotic material.

Fowler, in speaking of diffuse peritonitis secondary to appendicitis, says the essentials of treatment are: "the removal of the septic focus, as thorough local cleansing as the circumstances will permit, the introduction of a glass drain into the pelvis, and rapid closure of the peritoneal cavity." Only exceptionally is the surgeon justified in "flushing the peritoneal cavity with a Chamberlain tube and forced irrigation," while "a patient with diffuse peritonitis of appendicular origin who survives after eventration is employed to assist in the cleansing of the peritoneal surfaces would have recovered without this aid. On the other hand, the promptness with which patients have

died following this manipulation in my experience suggests to me that this had something to do with the rapid death." He advises elevation of the head and trunk to promote the flow of fluid into the pelvis. "Massive gauze packing or multiple and radiating gauze strips placed between the intestinal coils is probably never of real service, and may be productive of harm."

Weeks advocates "the thorough cleansing of all the intestines, which sometimes may require their removal from the abdominal cavity. This cleansing is best done by irrigation, several times repeated. After thorough cleansing, by irrigation and sponging, a glass drainage-tube open at both ends and a strip of gauze, pushed into the tube from end to end, should be passed well down into the pelvic cavity, and the whole infected area packed with sterile gauze. Strips of gauze should be passed in various directions among the intestines, so that perfect capillary drainage may be secured throughout."

Harte, in speaking of diffuse peritonitis following perforation of a typhoid ulcer, says that extensive intestinal manipulation or evisceration through a second or median incision is of doubtful wisdom. He prefers prolonged irrigation, "with the hand of the operator in the abdominal cavity gently separating the folds of intestine so as to permit the irrigating fluid to come in contact with all portions of the infected surface. The abdomen can be drained with either a glass or a rubber drainage-tube. In our judgment the use of large pieces of gauze carried well down to the pelvis is preferable, other pieces being distributed through different parts of the abdomen in such a way as to pretty thoroughly close the abdominal wound and prevent any escape of the intestine. . . . These pieces of gauze should be allowed to remain in the wound for three or four days. Their removal may be facilitated by thoroughly saturating with either salt solution or hydrogen peroxide."

Vaughan, in speaking of diffuse peritonitis secondary to gunshot wounds of the intestine, says that the patient should be given a chance for life by thorough irrigation and efficient drainage. He removes the intestines from the abdominal cavity, if necessary, to accomplish this, and drains with gauze or a tube in the pelvis, sometimes passing the drain into the vagina.

Lund, who has for several years been in close touch with a very active service in the Boston City Hospital, contributes a valuable article on diffuse peritonitis to the *Boston Medical and Surgical Journal*, 1903, vol. cxlix. p. 583. He considers the removal of the focus of the infection by early operation to be the prime essential of treatment. The policy of waiting, washing the stomach, and giving rectal injections, which is advocated by Ochsner, has been tried, with the result

that usually the patient must be operated upon later when conditions are less favorable.

The second object of treatment, according to Lund, is the removal of infectious products. He does this by irrigation with gallons of decinormal salt solution at 110° F., introduced through a large glass nozzle so that the current of fluid within the abdomen is everywhere toward the wound. This cleanses without the shock of evisceration. Loose fibrin is washed out. Attached fibrin is allowed to remain. Scrubbing or peeling the fibrin from the intestine adds to the shock and leaves raw bleeding surfaces for further infection.

Lund believes in gauze drainage. In the first few hours, at any rate, the gauze removes by capillarity a good deal of fluid, some of it probably septic. A glass tube surrounded by gauze wicks is passed into the pelvis. It is removed in twenty-four hours. The tube serves to keep the gauze in position.

Elevation of the pelvis was advocated in the Johns Hopkins School some years ago on the ground that the lymph vessels in the diaphragmatic portion of the peritoneum would thereby be assisted in disposing of infectious material. This position is uncomfortable, and experience has not shown that its use is attended by a greater percentage of recovery.

Murphy, of Chicago, has advocated the half-sitting posture so that fluids may flow to the pelvis, whence they are more easily removed by drains. Lund believes this a rational procedure, but he has found it exhausting to the patient. He, therefore, contents himself by placing one or two pillows beneath the shoulders of the patient and raising the head of the bed about one foot. This is sufficient to cause a flow of fluid from the flanks into the pelvis, and makes lumbar drainage unnecessary.

Enterotomy is useful in cases of diffuse peritonitis with greatly distended intestines. Gas and fecal matter are allowed to escape; two ounces of saturated solution of Epsom salts are introduced into the bowel, and the opening is sutured. If a second enterotomy is required it may be performed through a short incision in the median line. A loop of small intestine is sutured into the wound, and opened and drained for a few days by means of a glass tube. This procedure has proved effective in certain desperate cases where death was apparently impending after operation for diffuse peritonitis.

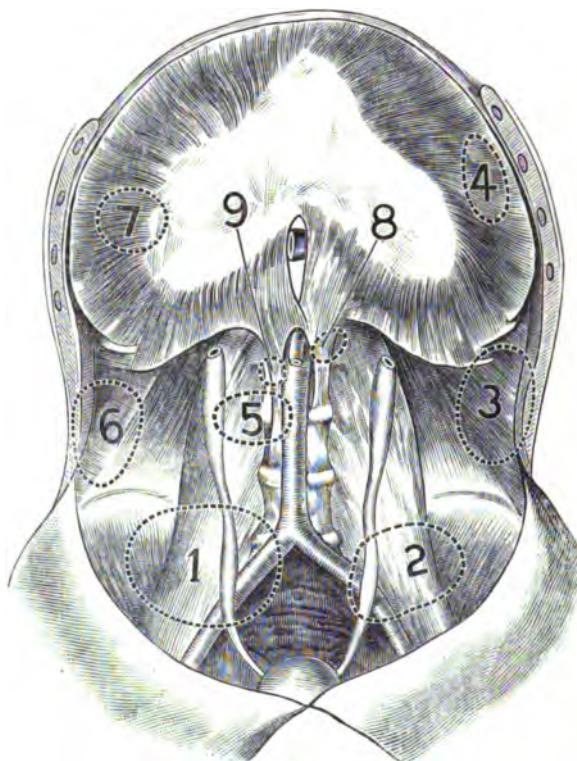
Knott<sup>1</sup> is more enthusiastic over the advantages of a semirecumbent position for patients with diffuse peritonitis, and reports five cases of recovery following the employment of this posture. He also states

<sup>1</sup> American Medicine, 1903, vol. vi. p. 147.

that death did not occur so soon in the fatal cases as might have been expected.

He further advocates this position following laparotomies of whatever nature, on the ground that it reduces nausea and vomiting and facilitates recovery. It is a standing order in the hospital with which he is connected to elevate the head of the bed thirty inches for at least twenty-four hours after every cœliotomy.

FIG. 6.



A cut of the abdominal muscularis to indicate location of peritoneal adhesions from muscular trauma ; 1 and 2, ventral surface of the psoas muscles ; 3 and 6, regions along the vertical coils ; 4 and 7, bilaterally on the diaphragm ; 5, point where duodenum crosses psoas ; 8 and 9, crura diaphragmatica.

**Peritoneal Adhesions Due to Muscular Action.** Robinson<sup>1</sup> believes that in many cases local peritonitic adhesions are caused by muscular action, and especially by the psoas muscles. Other muscles which may be responsible for such adhesions are the diaphragm, the levator ani, and coccygeal muscles. (Fig. 6.) If a portion of the intestinal tract lies within range of the action of such a strong muscle as the psoas, it

<sup>1</sup> Medical Record, 1903, vol. lxiv. p. 324.

may be so bruised by muscular action that bacteria or their products can find their way through the lumen of the bowel and set up a local inflammation.

To this cause he ascribes many of the cases of inflammation of the appendix, as this is the weakest segment of the intestinal tract.

The following is a statistical statement of the peritoneal adhesions found in 485 autopsies on adult subjects. They were not, of course, all due to muscular traumatism, but Robinson believes that a considerable portion were so caused.

Percentage of peritoneal adhesions found in 350 autopsies in adult males :

Appendix, 60 per cent. ; cæcum, 60 per cent. ; distal ileum, 50 per cent. ; 75 per cent. exists adjacent to right iliopsoas.

Mesosigmoid, 85 per cent. ; ligamentum entericocolicum, 55 per cent. ; intersigmoid fossa, 80 per cent. ; 85 per cent. exists adjacent to left iliopsoas.

Spleen, 90 per cent. ; liver, 44 per cent. ; Haller's omentum, 45 per cent. Right crus of diaphragm.

Ligamentum phrenocolicum dextra, 35 per cent. ; ligamentum phrenocolicum sinistra, 80 per cent. ; ligamentum hepaticocolicum, 85 per cent.

Fossa duodenojejunalis, 30 per cent. Left crus of diaphragm, 80 per cent. exists in the colon, the peritonitic or exudative area ; 45 per cent. exists in the enteron, the absorptive or non-exudative area ; 90 per cent. exists in the tractus intestinalis.

Percentage of peritoneal adhesions found in 135 autopsies in adult females :

Appendix, 48 per cent. ; cæcum, 55 per cent. ; distal ileum, 40 per cent. ; 70 per cent. exists adjacent to right iliopsoas.

Mesosigmoid, 80 per cent. ; ligamentum entericocolicum, 45 per cent. ; 80 per cent. exists adjacent to left iliopsoas.

Spleen, 88 per cent. ; liver, 60 per cent. ; Haller's omentum, 60 per cent. Right crus of diaphragm.

Ligamentum phrenocolicum dextra, 52 per cent. ; ligamentum phrenocolicum sinistra, 45 per cent. ; ligamentum hepaticocolicum, 80 per cent.

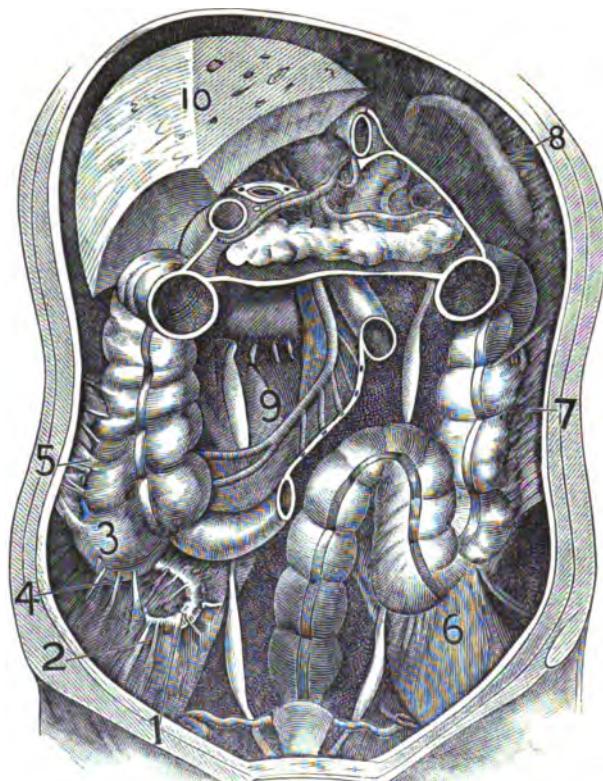
Fossa duodenojejunalis, 22 per cent. Left crus of diaphragm, 80 per cent. exists in the colon, the exudative or peritonitic area ; 40 per cent. exists in the enteron, the absorptive or non-peritonitic area ; 88 per cent. exists in the tractus intestinalis ; 75 per cent. exists in the tractus genitalis.

Peritoneal adhesions from muscular trauma do not occur in infants or in children previous to walking. The active muscular action of the

erect position brings force to bear, especially in the region of the cæcum and of the sigmoid flexure.

Peritoneal adhesions demand surgical intervention if they involve such mobile organs as the jejunum, ileum, appendix, transverse colon, sigmoid, or oviducts. (Fig. 7.) Such adhesions may interfere with peristalsis and normal secretion and absorption of the intestine. They

FIG. 7.



Illustrates peritoneal adhesions adjacent to the appendix (1 and 2), cæcum (3 and 4), vertical colic (5 and 7), mesosigmoid (6), spleen (8), transverse duodenum (9).

may destroy the shape of the organ or alter its position, or obstruct its lumen. They may cause neuroses and otherwise disturb the nervous system. They may interfere with circulation and produce chronic catarrh and constipation.

**Laparotomy in Tuberculous Peritonitis.** Eichberg<sup>1</sup> scouts the idea of improving the condition of a patient suffering from tuberculous peritonitis by means of an abdominal incision. In cases with ascites

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xli. p. 829.

a withdrawal of the fluid will afford mechanical relief, otherwise the operation does no good. The percentage of recoveries without operation, for all ages, and with or without complications, is greater than with operation. Abdominal tension can be relieved by tapping, and most of these patients will recover under tonic treatment. In support of his opinion, Eichberg quotes from various writers upon this subject, and gives the history of eight cases of which he had personal knowledge.

Lobingier<sup>1</sup> reviews the literature upon peritoneal tuberculosis, and accepts Veit's conclusions as the sanest which have been presented upon this much-discussed subject.

Veit believes that peritoneal tuberculosis may become cured spontaneously, but does not admit that as many will recover without operation as with it. He considers laparotomy, in all but the ulcerative caseous variety, almost invariably rewarded by cure or substantial benefit, the few failures being due to an advanced and general infection of other organs. In recent cases operation should be promptly performed. Chronic subjects should be closely observed, and operated on if spontaneous subsidence seems improbable. Veit favors simple section in the linea alba, mopping out the effused fluid, and closure of the wound. Where the adnexæ are involved they should be removed. Cure he believes to be due to the antitoxic action of the serum from the wound. Statistics show 50 per cent. cured and 25 per cent. greatly benefited after the lapse of from four to five years from the date of laparotomy. Tuberculous lesions in localities outside the abdomen are not materially benefited.

Ochsner,<sup>2</sup> from a careful study of thirty-two cases of tuberculous peritonitis treated by one operation in one hospital, and eight other cases of operation performed by himself, draws the following conclusions :

1. In the absence of ascitic fluid in the peritoneal cavity the diseased tissues may be removed with safety if the section is made entirely in healthy tissue.
2. In the presence of ascitic fluid the latter should be evacuated and the abdominal cavity drained.
3. Great care should be exercised in making the intra-abdominal manipulations and examination so as not to cause any abrasions.
4. Adhesions should not be disturbed.
5. The less the tissues are manipulated the better will be the results.
6. Manipulation of the infected pelvic organs—uterus, ovaries, Fallopian tubes—is less harmful than manipulation of the infected intestines.

<sup>1</sup> New York Medical Journal, 1903, vol. lxxviii. p. 1077.

<sup>2</sup> Annals of Gynecology and Pediatrics, Boston, 1903, vol. xvi. p. 507.

TUBERCULOUS PERITONITIS IN INFANTS. Rotch<sup>1</sup> has shown by report of forty-three cases that tuberculosis of the peritoneum may occur both in infancy and in childhood. The disease in childhood is more frequently localized in the peritoneum, and is more chronic in its course than is usually the case in infants. The most favorable form for treatment by laparotomy is miliary tuberculosis of the peritoneum with ascites, while the less favorable form for laparotomy is the fibrous form of the disease. In this the prognosis seems more favorable if ascites is present.

Rotch reports the results in thirty-two cases of treatment by operation. Twenty patients, or 62.5 per cent., were discharged cured or improved, while twelve, or 37.5 per cent., died from the operation. He was able to trace thirteen of the above-mentioned twenty patients, and found that ten were well at periods varying from three months to nine years, while one patient was undergoing a relapse, and two had died.

## THE STOMACH.

**McGraw's Elastic Ligature.** The use of an elastic ligature to cut its way through the stomach and intestine after firm adhesions have formed between them was advocated by McGraw<sup>2</sup> in 1901. After successful tests upon dogs, he first used the ligature for gastroenterostomy for pyloric cancer in 1891. The patient died in fifteen days, apparently from inanition, as the loop selected for anastomosis was the ileum not far from the ileocecal valve. This anastomosis was satisfactory, and there was no peritonitis.

For many years the use of Murphy's button has turned attention from other mechanical methods of anastomosis; but in spite of all care the button sometimes drops back into the stomach, or, for some other reason, fails to pass per anum, and second operations have been performed for its removal, so that it must be admitted that Murphy's button is not an ideal device for gastroenterostomy, whatever may be said of it for anastomosis elsewhere.

Several surgeons have recently been testing anew the McGraw elastic ligature.

Lloyd<sup>3</sup> describes the introduction of the ligature, and reports its use in eighteen gastroenterostomies by himself and others, with five deaths, three of which could not properly be ascribed to the use of the ligature.

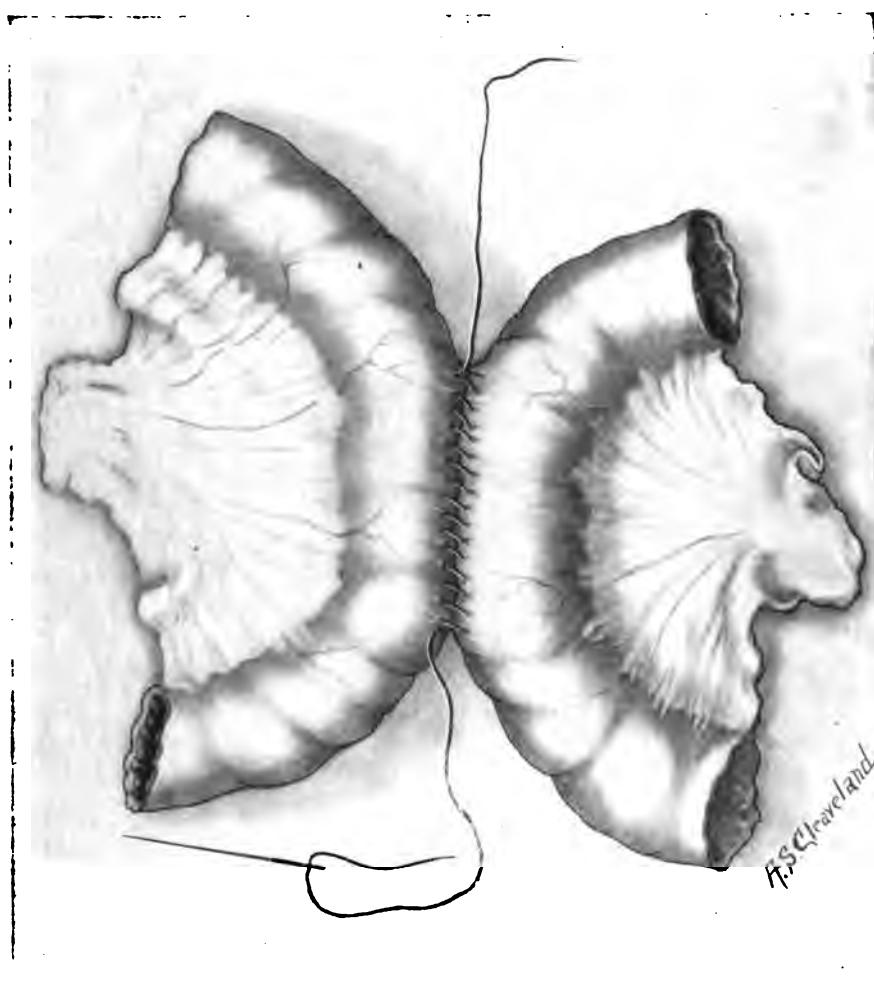
<sup>1</sup> Journal of the American Medical Association, 1903, vol. xl. p. 69.

<sup>2</sup> New York Medical Journal, vol. lxxiii. p. 133.

<sup>3</sup> American Medicine, 1903, vol. vi. p. 699.

The illustrations (Figs. 8, 9, 10, 11, 12) almost make description superfluous. The fields of anastomosis (in the cuts, intestinal) are attached by a posterior continuous Lembert suture. (Fig. 8.) The

FIG. 8.



Approximation of serosa with continuous silk suture.

elastic ligature, threaded on a worsted needle, is then passed into and out of one viscus and into and out of the other. (Fig. 9.) It is then tightly tied, and the knot secured by a silk ligature. (Figs. 10 and 11.) The ends of the ligature are clipped off close, and the field

of anastomosis is covered by completing the Lambert suture anteriorly. Walker,<sup>1</sup> from whose descriptive article the illustrations are taken, says that "of all the methods that have been suggested for the per-

FIG. 9.



Elastic ligature introduced.

formance of lateral intestinal anastomosis none, to my mind, possesses the advantages of the McGraw elastic ligature.

"1. Its simplicity, which is far greater than any other method yet presented.

<sup>1</sup> Journal of American Medical Association, 1903, vol. xl. p. 166.

- " 2. Ease and rapidity with which it can be done.
- " 3. Less liability to sepsis than by any other method.
- " 4. No danger of a foreign body."

FIG. 10.



One tie of the elastic ligature with a strong silk ligature underneath ready to fasten the elastic ligature where it is drawn taut.

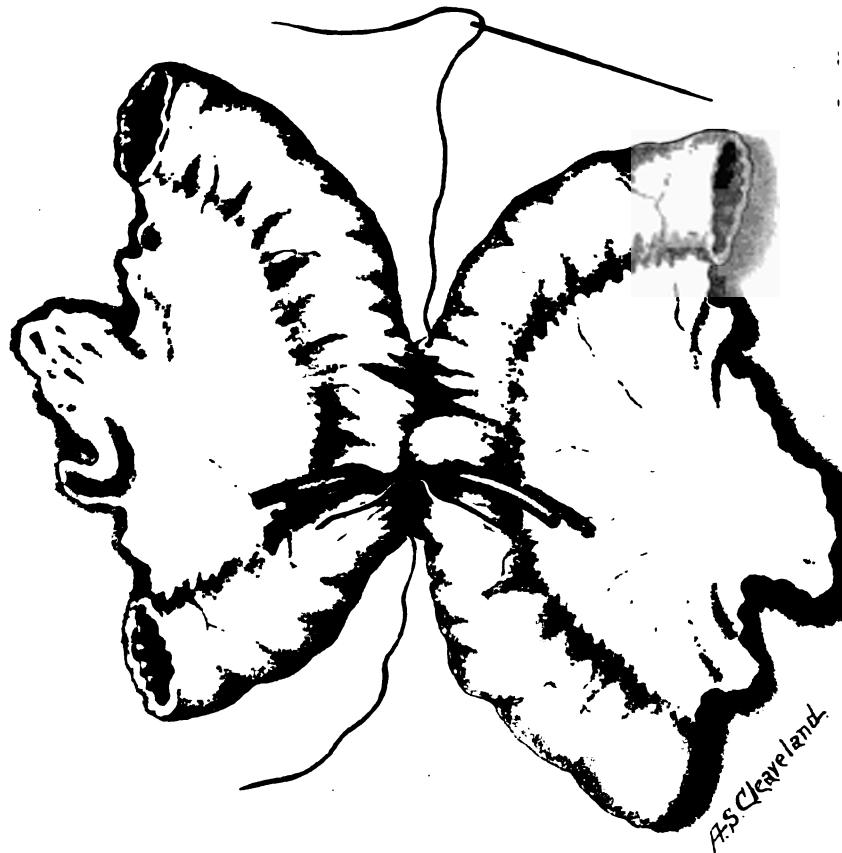
" 5. A larger opening can be made without liability to cicatricial contraction."

**EXPERIMENTS WITH McGRAW'S LIGATURE.** Maury<sup>1</sup> reports a number of experiments upon dogs in order to see if the McGraw elastic

<sup>1</sup> Medical News, 1903, vol. lxxxiii. p. 483.

ligature can be made to punch out an opening between the stomach and intestine. This ligature is a round, solid cord of black rubber elastic a foot long, and so sharpened that it may be easily threaded

FIG. 11.

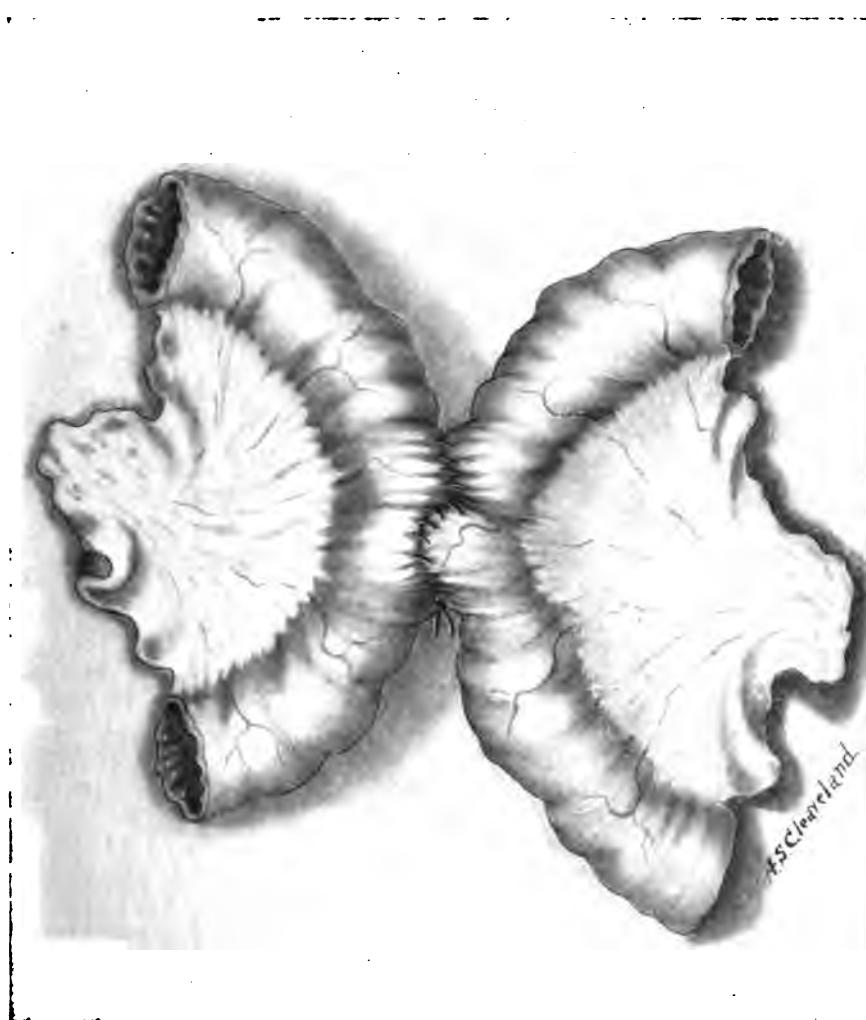


Ligature tied.

through a large-eyed needle. It will stretch over six times its length, and is unbreakable with the ordinary force of the fingers. As applied in the ordinary manner the opening which it cuts is irregular, and may have bands across it. McGraw found that it is possible at will to

make the opening a triangle, square, heptagon, etc. For practical purposes a square is a circular opening. The directions for insertion are as follows :

FIG. 12.

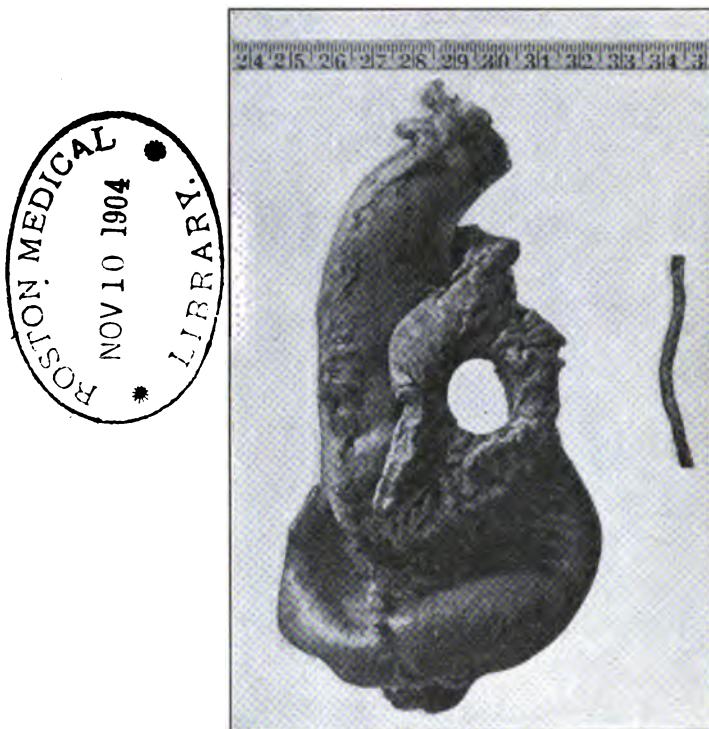


Operation complete, continuous suture entirely covering knot.

Decide on the size of the square desired, and, after approximating the surface, gut and gut or stomach and gut, so that there may be no unnecessary tension, place a Lembert stitch of silk to join the two viscera at each of two points destined to be the diagonally opposite angles of the completed square. These stitches will hold the parts together and will serve as guides for the introduction of the ligature.

The needle is introduced into one of the apposed viscera at a point selected for one of the remaining angles and brought out beside one of the guides. From here it is passed through the opposite organ, care being taken that the needle thoroughly pierces the mucous membrane—which is somewhat resistant in a dog, but not so in a pig—and out again at a point diagonally opposite the starting place. From this point to the point of beginning the steps are directly reversed, viz.,

FIG. 13.

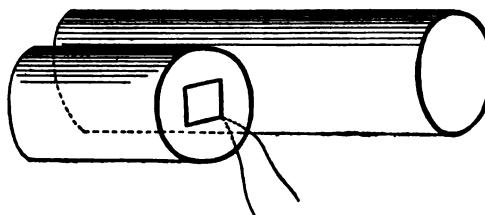


Dog's stomach with section of jejunum attached, the latter split open to show its mucous membrane. The preparation was hardened in formalin, a cork which dropped into the fistula by its own weight having been inserted to prevent shrinkage.

the needle re-enters the first viscera, emerges at the first guide, re-enters the second viscera and emerges as nearly opposite the starting point as possible. The stitch is then just half done; two sides of the square are completed, and the arrangement of the elastic ligature may be correctly represented by a figure 8 bent in the middle. The remaining two sides of the square are completed in the same manner, care being taken to make the distal loops of the two figures of 8 interlock." (Fig. 14.)

The ends of the elastic may be tied with fine silk, or, better, with iodized catgut, which does not slip and is ultimately absorbed. Size No. 2 was found to hold the ligature long enough to allow it to punch out the mucous membrane. The absorption of the gut frees the rubber

FIG. 14.



Crinoline model, showing the method of applying the stitch.

ligature, and it is either vomited or passed by rectum as a separate cord. (Fig. 13.)

From the seventeen autopsies already performed Maury concludes :

1. The McGraw elastic ligature can be so inserted as to "punch out" as large an area of the juxtaposing walls as may be desired,

FIG. 15.

Dog's stomach, showing duodenum and quadrangular opening. Size shown by cm. scale.  
(MAURY.)

with at least as much certainty and with greater safety than the Murphy button.

2. That the margins of such openings are smooth and not unduly cicatrized.

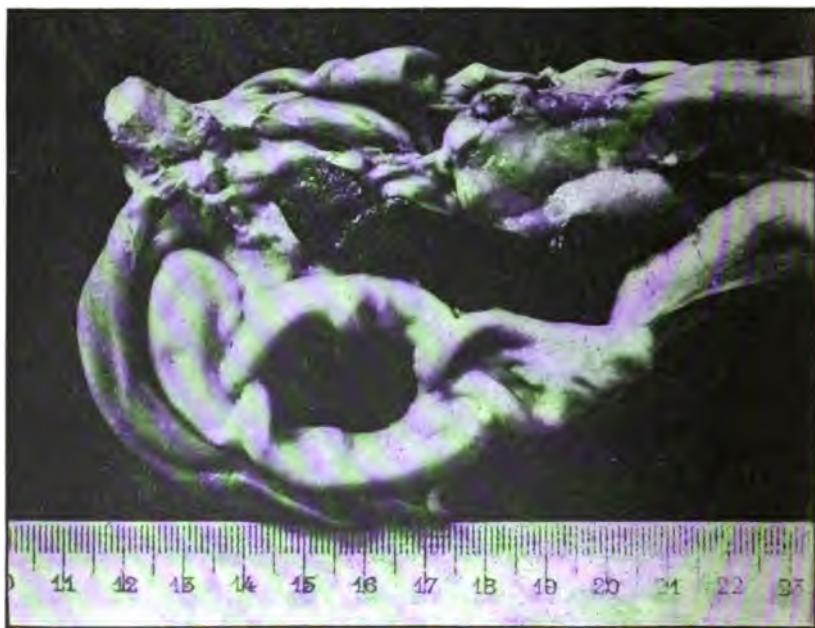
3. That the elastic ligature may remain *in situ* after punching the openings, although this is less likely to happen if tied with iodized catgut.

FIG. 16.



Dog's stomach seen from serous surface, showing a very satisfactory opening. (MAURY.)

FIG. 17.



Photograph to show the actual opening made by means of the elastic ligature between the stomach and jejunum. (MURPHY.)

4. That such retention in the mucosa of so soft a material is not apt to be harmful or permanent.

Murphy,<sup>1</sup> of Boston, has also been testing McGraw's ligature experimentally, and finds a successful anastomosis between the stomach and

FIG. 18.



Thirty days after operation, the adhesions of the omentum have practically disappeared and the external line of union between the stomach and jejunum shows as a fine line. *a*, internal line of union; *b*, external line of union. (MURPHY.)

<sup>1</sup> Boston Medical and Surgical Journal, 1904, vol. cl. p 81.

intestines, or two loops of intestine, is possible by means of the elastic ligature. The method is not applicable when an immediate opening is required.

The time of the cut-out varies, depending upon the character of the ligature, the method of application, and the resistance of the tissues in any case, but the ligature will ultimately cut out.

A knot at either end of the elastic loop increases the rapidity of the cut-out.

The pinching of the gut by the ligature seems to cause no bad symptoms.

The serous surface of the outside of the joint when completed is smooth.

The anastomosis by gross or microscopic examination shows no evidence why there should be any greater tendency to contraction of the opening than with the ordinary methods of intestinal suture.

The procedure causes a minimum operative risk, both as regards shock and infection.

Adhesions across the opening are a possible but not a probable complication. In cases in which an immediate opening of the bowel is not imperative, and in which the avoidance of operative shock is an important factor, the elastic ligature may prove to be the operation of choice in gastroenterostomy and lateral anastomosis. (Figs. 17 and 18.)

**Anticolic Posterior Gastrojejunostomy.** Hall<sup>1</sup> advocates drawing the posterior wall of the stomach through an opening in the gastrocolic omentum instead of the transverse mesocolon. The gastrocolic omentum is a thin, practically bloodless membrane, and there is, therefore, no chance of interference with the vascular supply. There is no risk that contraction of the opening will cause pressure on the loop of the jejunum, and hence no necessity for suturing the margins of the aperture to the stomach wall as recommended in the case of mesocolon.

Trendel<sup>2</sup> gives the mortality of twenty-eight patients upon whom *posterior jejunostomy* was performed at Tubingen. It was 21.4 per cent. The combined statistics of Czerny, Steinthal, and von Bruns in 269 cases show a mortality 18.2 per cent. A vicious circle was not produced in any case. Trendel employs the Murphy button, but in one case reported the button fell back into the stomach and produced a fatal hemorrhage.

Foederl<sup>3</sup> attributes the symptoms of vicious circle occurring after gastrojejunostomy to the formation of a sharp angle by the anastomosed loop. This throws the lower wall of the bowel into a sharp fold

<sup>1</sup> British Medical Journal, 1903, vol. ii. p. 895.

<sup>2</sup> Beiträge zur klin. Chirurgie, 1903, Band xxxix. p. 113.

<sup>3</sup> Wiener klin. Wochenschrift, 1903, Band xvi., No. 39.

which acts like a valve. Shortening of the mesentery by two or three interrupted stitches will prevent this angularity. They form a tuck in the mesentery so that the intestine must remain in a broad curve.

**Condition of the Stomach and Intestine Six Years after Successful Gastroenterostomy.** Cordier<sup>1</sup> performed gastroenterostomy for ulcer of the pylorus with stenosis upon a patient aged thirty-eight

FIG. 19.



Gastrojejunostomy. Pyloric stricture (*S*) from healed gastric ulcer. Pyloric end of stomach displaced downward, hence the location of anastomosis (*A*).

years, who weighed 115 pounds, and was taking 20 grains of morphine a day. The pylorus was displaced as well as contracted, and the stomach was much dilated. Anastomosis was, therefore, made about four inches from the pylorus. Murphy's button was employed. In a few days the patient was able to take nourishment without inconvenience. He gave up the morphine habit, and gained flesh until he

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xli. p. 945.

weighed 180 pounds. He was in apparently perfect health six and one-half years later, when he was seized with an attack of pneumonia, and died in two weeks. Fig. 19 is from a photograph of the stomach and intestine removed at autopsy. The pylorus was completely obstructed. Dilatation of the stomach had disappeared, and its muscles were in a healthy condition. The duodenum and first portion of the jejunum were atrophied from disease. At the site of the anastomosis there was absolutely no omental or other adhesions except those made by the union of the bowel to the stomach. The opening from the stomach into the lower segment of the bowel was as large, seemingly, as at the time of the operation. There appeared to be a species of valvular action that prevented the contents of the stomach from going into the upper coil of the bowel. A similar arrangement seemed to exist, preventing the bile from going into the stomach. On filling the stomach with air or water not one drop or bubble could be forced through the pylorus. The water would enter the lower segment of the bowel with perfect ease, but none at all would go into the upper segment until after the stomach and lower segment of the bowel were thoroughly distended.

As remarkable as it might seem, the Murphy button instead of passing into the intestine and finding its way out into the external world, as is usual, had dropped into the stomach and remained there for nearly seven years, or until the time of his death. Its presence in the stomach had never given rise to a single symptom. One end of the button was very much destroyed, presumably by the secretions of the stomach.

**Treatment of Gastric Ulcer.** Moynihan<sup>1</sup> says that the hemorrhage from an acute ulcer of the stomach, though alarming from its suddenness and its intensity, will subside in the majority of cases and will not recur. Such a patient may safely be treated by medical means alone. In a few cases hemorrhage recurs, and may threaten the life of the patient. The best operation under such circumstances is *gastro-enterostomy*. The search for a bleeding point is futile, harmful, and quite unnecessary, since the performance of gastroenterostomy will prove more effective than any other procedure, both in checking the hemorrhage and in preventing its recurrence.

In chronic ulcer, owing to the inflammatory thickening about the eroded vessel, the artery may be unable to retract, and the bleeding can only be stopped by the formation of a clot. Such a clot is easily dislodged when the stomach is distended, and, as a result, hemorrhage recurs. In these chronic cases, as in the acute ones, the best treatment is gastroenterostomy. Moynihan has operated upon seventy patients,

<sup>1</sup> Medical News, 1903, vol. lxxxii. p. 1057.

losing only one of them, and in this patient he treated the ulcer, but did not perform gastroenterostomy.

Moynihan considers inveterate dyspepsia ample warrant for surgical treatment. His series of cases has shown him that chronic dyspepsia is more often a matter of physics than of chemistry. An ulcer near the pylorus causes dilatation, while if it is nearer the centre of the organ it may produce an hour-glass stomach. Such chronic ulcers are rarely solitary. No matter where the ulcer is placed the gastroenterostomy will relieve the symptoms completely and permanently, and will permit of a sound healing of the ulcer. To excise all the ulcers is often out of the question, unless a partial gastrectomy is performed. But, if the chief offending ulcer be excised, gastroenterostomy would still be necessary, for among the cases of excision of ulcer which are recorded there is not infrequent mention of little or no permanent improvement. In all cases, therefore, gastroenterostomy alone should be performed. Excision is unnecessary, often impossible, always insufficient, and is, therefore, not to be commended.

On three occasions Moynihan performed pyloroplasty. The operation is one which, both from its ingenuity and its immediate success, appeals strongly to the surgeon. It is, however, unreliable, a return of the symptoms being not seldom observed. One of his patients remains perfectly well, the second is better, but is certainly not in such good health as the average patient after gastroenterostomy, the third showed a speedy return of all the symptoms, and he then performed gastroenterostomy, with a perfectly satisfactory result. The return of the symptoms seem to be due, in part, to a narrowing at the site of the pyloroplasty and, in part, to the formation of widespread and tough adhesions around the pyloric portion of the stomach—adhesions which must seriously hamper the stomach in its freedom of action.

In the performance of gastroenterostomy Moynihan prefers a simple suture to any artificial aid. The operation takes thirty-five minutes, or even less. Speed, he says, is essential ; haste is often disastrous ; the two should be distinguished. The work must be thoroughly done, but if so done, the quicker it is done the better. In Moynihan's cases there is no record of leakage after gastroenterostomy.

The following are the steps of the operation of gastroenterostomy : The abdomen is opened to the right of the middle line, and the fibres of the rectus are split. On opening the peritoneum a complete examination of the whole stomach and duodenum is made. The importance of this cannot be overemphasized. A constriction in the body or toward the cardiac end may be most readily overlooked when, as is not uncommonly the case, a marked constriction at the pylorus, seen at once, is ample to account for all the symptoms. Cases of hour-glass

stomach have been overlooked at operation and a futile anastomosis made between the pyloric pouch and the jejunum by several distinguished operators.

The great omentum and transverse colon are lifted out of the abdomen and turned upward over the epigastrium. The under surface of the transverse mesocolon is exposed, and the vascular arch formed mainly by the middle colic artery is seen. A bloodless spot is chosen, a small incision made in the mesocolon, and the finger passed into the lesser sac. The opening in the mesocolon is then gradually enlarged by stretching and tearing until all the fingers can be passed through it. It is very rarely necessary to ligature any vessel. The hand of an assistant now makes the posterior surface of the stomach present at this opening, and the surgeon grasps the stomach and pulls it well through. A fold of the stomach, about three inches in length, is now seized with a Doyen's clamp. The clamp is applied in such a way that the portion of the stomach embraced by it extends from the greater curvature obliquely upward to the lesser curvature and toward the cardiac. The duodenojejunal angle is now sought and readily found by sweeping the finger along the under surface of the root of the transverse mesocolon to the left of the spine. The jejunum is then brought to the surface, and a portion of it, about nine inches from the angle, is clamped in a second pair of Doyen's forceps. The two clamps now lie side by side on the abdominal wall, and the portions of stomach and jejunum to be anastomosed are well outside the abdomen embraced by the clamps. The whole operative area is now covered with gauze wrung out of hot sterile salt solution, the clamps alone remaining visible. A continuous suture is then introduced, uniting the serous and subserous coats of the stomach and jejunum. The stitch is commenced at the left end of the portions of gut enclosed in the clamp, and ends at the right. The length of the sutured line should be at least two inches. In front of this line an incision is now made into the stomach and jejunum, the serous and muscular layers of each being carefully divided until the mucous membrane is reached. As the cut is made the serous coat retracts, and the mucous layer pouts into the incision. An ellipse of the mucous membrane is now excised from both stomach and jejunum, the portion removed being about one and three-quarter inches in length and half an inch in breadth at the centre. The stomach mucosa shows a tendency to retract; it is therefore seized with a pair of miniature volsella forceps on each side. No vessels are ligatured. The inner suture is now introduced. It embraces all the coats of the stomach and jejunum, and the individual stitches are placed close together and drawn fairly tight so as to constrict all vessels in the cut edges. The suture begins at the same point as the outer

one, and is continued without interruption all round the incision to the starting point, where the ends are tied and cut short. It will be found that there is no need to interrupt the stitch at any point, for there is no tendency on the part of the sutured edges to pucker when the stitch is drawn tight. The clamps are now removed from both the stomach and the jejunum in order to see if any bleeding point is made manifest. Very rarely, about once in ten cases, a separate stitch at a bleeding point is necessary. The outer suture is now resumed and continued round to its starting point, being taken through the serous coat about one-sixth of an inch in front of the inner suture. This outer stitch is also continuous throughout ; when completed the ends are tied and cut short as with the inner stitch. There are thus two suture lines surrounding the anastomotic opening : an inner, haemostatic, which includes all the layers of the gut ; and an outer, approximating, which takes up only the serous and subserous coats. For both stitches thin Pagenstecher thread is employed. No sutures are passed through the meso-colon and stomach. The gut is lightly wiped over with a swab wet in sterile salt solution, the viscera returned within the abdomen, and the partial wound sutured layer by layer. When the patient is replaced in bed the head and shoulders are supported by three or four pillows. The operation lasts from beginning to end about thirty to thirty-five minutes, but can be shortened by five or ten minutes if the condition of the patient demands it.

Moynihan's views in regard to the treatment of gastric ulcers by gastroenterostomy are not shared by all surgeons. For instance, Moullin<sup>1</sup> has this to say :

" Excision of such an ulcer, so long as it is confined to the mucous membrane and does not greatly involve the seromuscular coat, is comparatively simple. I have operated upon five such, three by excision and two by ligature of the whole thickness of the wall, and in each repair was rapid and complete. There is no reason why the operation should be followed by a higher rate of mortality than that which follows interval operations for inflammation of the appendix. Later, when the strength of the patient is broken down by years of chronic starvation, and all sorts of complications are present, the same operation may easily become one of the most difficult in surgery, so that not infrequently it has to be abandoned. But this is not an argument against operation, but against delay.

" I am strongly in favor, wherever it is possible, of dealing with the ulcer itself, whether this is done by excision or by ligature. Gastroenterostomy should be reserved for cases in which this is imprac-

<sup>1</sup> British Medical Journal, 1903, vol. i. p. 953.

ticable, in which, for instance, the ulceration is multiple, or in which it obstinately recurs, or in which there is already some degree of stenosis at the pylorus or in the walls of the stomach. It places the stomach at rest, it is true, and so often enables the ulcer to heal ; but it cannot stop bleeding (there are at least two cases on record in which the hemorrhage has continued and proved fatal, and I have been told of a third), and it is at best only a way of evading difficulties which are better met directly, before they have attained dimensions which render this impossible."

**Perforating Ulcer of the Stomach and Duodenum.** Reports of successful suture of perforating ulcers of the stomach and duodenum have become so numerous that single cases excite little comment. Brunner<sup>1</sup> has collected from the literature nearly 600 cases of acute perforation treated by operation. Most of these operations were performed in England and Continental countries, only 58 of them being performed in America. He advocates the prompt excision of the ulcer, and says that freshening its edges and suture are only permissible under circumstances which preclude excision. About one-third of the patients operated upon have recovered.

A paper of more practical value is one by English<sup>2</sup> upon 50 consecutive cases of perforated gastric and duodenal ulcer treated in St. George's Hospital. Premonitory symptoms are most likely to occur in cases of chronic and marked ulcer. There is a progressive increase in discomfort and pain after eating, with vomiting and superficial and deep tenderness in the epigastrium. When such conditions occur active and deep ulcer should be suspected, the patient put to bed, and no food administered by the mouth. Morphine should be avoided as masking the symptoms. The condition of the patient is no guide to the lesion. Vomiting occurred in over 75 per cent. of the cases studied, usually shortly after perforation, and generally with recurrence during the first few hours. The situation of the perforation is nearly always near the lesser curvature rather than the greater. The most frequent complication is pleurisy. Parotitis occurred in 5 cases. All symptoms and physical signs of perforation may be presented, and yet the stomach be found intact, but the correct treatment is to explore whenever perforation is suspected. General irrigation of the peritoneal cavity was employed in 31 of the 50 cases ; local irrigation in 9 cases, and in the remainder sponging only was employed. The mortality was 50 per cent. in all. There is an increasing tendency to dispense with drainage. The after-conditions of successful cases were surprising to him. In all of the 24 cases which he followed up there were no

<sup>1</sup> Deutsche Zeitschrift f. Chirurgie, 1903, Band lxxix. p. 101.

<sup>2</sup> Lancet, 1903, vol. ii. p. 1707

gastric or other symptoms. In 4 there were dyspeptic symptoms, but no signs of gastric ulcer. In 1 there was some evidence of peritoneal adhesions, and in 1 œdema of the leg following thrombosis; 7 patients were not traced.

**Perigastritis.** Knott<sup>1</sup> speaks of the diagnosis of perigastric adhesions due to gastric ulcer, a diagnosis which should be more frequently made than is at present the case. If adhesions exist between the stomach and the anterior abdominal wall the condition is more easily recognized. If they are at or near the pylorus they may interfere with the passage of the contents of the stomach, and so produce dilatation and other symptoms similar to those of pyloric stenosis. In these patients the distress is most marked during the last stage of gastric digestion. The pain which appears at this time may disappear in a little while, or last for hours. During the paroxysm the patient can bear no pressure in the right hypochondriac region. Vomiting is an almost constant symptom, and may even threaten the patient's life. With the lapse of time dilatation of the stomach becomes more marked, and the classical symptoms which accompany it are produced. In some cases induration due to the adhesions may be felt.

Change of posture may greatly modify the pain due to perigastric adhesions; thus, if there are adhesions between the stomach and liver and pancreas, a position on the hands and knees is more painful, while if the adhesions exist between the stomach and anterior abdominal wall such a position will relieve the pain. The recumbent position relieves pain due to adhesions to the liver and pancreas, and increases pain due to adhesions to the abdominal wall. Tight bandaging, by taking the strain off the adherent surfaces, may relieve the pain.

In suspected cases distention of the stomach by means of a stomach-tube and a Davidson syringe will often be helpful in establishing the diagnosis.

The treatment of perigastric adhesions is, of course, surgical. If the adhesions are not too extensive they may be separated, and the patient entirely cured. If they are too extensive to permit of a radical operation some relief may be gained by performing gastroenterostomy at the portion of the stomach which is lowest when the patient is in an upright position. Knott concludes his article by citing records of 7 cases in which operation was performed for perigastric adhesions. In 5 of these cases it was possible to separate the adhesions perfectly and to prevent their reformation by covering the raw surfaces with peritoneum, or omentum, or carbile membrane. In 1 case gastroenterostomy was also performed. In 1 case the adhesions were very

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xl. p. 1416.

extensive, and, although they were separated and the raw surfaces were covered with omentum and cartilage membrane, gastroenterostomy was not performed, and the symptoms speedily recurred. Knott believes that when the adhesions are so extensive it is better to let them alone and to perform a simple gastroenterostomy.

**ADHESIVE PERIGASTRITIS.** Vautrin<sup>1</sup> says that perigastric adhesions are often responsible for vomiting, pain, and other symptoms, all of which may entirely disappear after a suitable operation. If the adhesions are slight it is sufficient to detach them. If the raw surfaces thus produced are extensive they should be covered with peritoneum, or the base of the ulcer to which the adhesions were due should be resected. If a mass of adhesions surround the stomach, and the wall of the latter is much changed or its outlet is compressed, gastroenterostomy should be performed. In these severer cases the symptoms will not disappear at once. It may be some weeks, for example, before vomiting disappears entirely. The cure should not be despaired of, but its realization should be hastened by a careful regulation of the diet and mode of life, so as to assist the stomach in recovering its normal action.

**Cardiospasm.** Von Mikulicz<sup>2</sup> speaks of a spasm of the cardiac orifice similar to that of the pyloric orifice of the stomach. The lower portion of the oesophagus is dilated, and the passage of food into the stomach is interfered with. This disease was formerly described as an idiopathic dilatation of the oesophagus, but the primary lesion is invariably the spasm of the cardia. It may be associated with carcinoma, or may be the only lesion of the stomach which exists. This condition is usually observed in persons beyond middle age. It can be accurately diagnosed in life by means of the oesophagoscope. Von Mikulicz has observed about twenty cases. In extreme cases the patients die of starvation, as the food which is swallowed readily enough cannot pass the cardia into the stomach, and is regurgitated. A young woman, aged twenty-three years, was successfully treated by operation. Through an incision in its anterior wall the hand was passed into the stomach, and the cardiac orifice was stretched with an instrument similar to a glove stretcher, until the blades were 7 cm. (three inches) apart. The wounds in the stomach and abdominal wall were sutured, and the patient made a perfect recovery, being able to swallow and retain solid food.

**Gunshot Wound of the Stomach with a Single Opening.** Williams<sup>3</sup> operated upon a sixteen-year-old boy for gunshot wound of the

<sup>1</sup> Revue de Gynecologie, 1903, vol. vii. part 3.

<sup>2</sup> Transactions of the American Surgical Association, 1903, p. 124.

<sup>3</sup> Boston Medical and Surgical Journal, 1903, vol. cxlviii. p. 585. .

abdomen two inches above the umbilicus. There was a ragged wound through the stomach wall four inches from the umbilicus and two inches above its lower border, from which gas and some fluid were escaping. The stomach was distended with food. It was temporarily sutured and protected with gauze, while the lesser peritoneal cavity was explored. It contained neither blood nor gastric fluid. The wound in the stomach was enlarged, its contents evacuated, but no wound of exit of the bullet was found, nor was the bullet in the gastric contents. The wound in the stomach was sutured, the field of operation was flushed with salt solution, a gauze wick was passed into the lesser peritoneal cavity and another to the gastric suture. These were removed in five and seven days, respectively. The patient was fed for a week by rectal enemata, and thirst was controlled by rinsing the mouth and giving salt solution by rectum. The patient made a prompt recovery. The stools were examined for the bullet, but it was not found. The single wound in the stomach may have been due to a glancing blow.

**Gastrotomy for Foreign Bodies.** Friedenwald and Rosenthal<sup>1</sup> make a statistical report of 90 gastrostomies for foreign bodies hitherto reported within their personal knowledge.

The symptoms are pain, vomiting, loss of appetite, weakness, and emaciation. The size and number of foreign bodies in the stomach seems sometimes to have little to do with the severity of the symptoms. Balls of hair give few symptoms.

The diagnosis, if the patient is demented, is often difficult. The x-ray is in many cases a great help, but it should not be forgotten that the shadow of a foreign body in a somewhat dilated stomach may appear as low down as the iliac crest.

Recovery followed early operation (three weeks or less after swallowing) in the preantiseptic time in 75 per cent. of 4 cases; in the antiseptic and aseptic period in 93 per cent. of 28 cases. Late operations in the preantiseptic period gave 90 per cent. of recoveries in 10 cases; in the antiseptic and aseptic periods 86 per cent. of recoveries in 29 cases.

Operations for foreign bodies in the stomach for unknown periods gave 75 per cent. of recoveries in 8 cases in the preantiseptic period, and 93 per cent. of recoveries in 14 cases in the antiseptic and aseptic periods.

The comparison percentage of early and late operations is not of great value because a smooth foreign body may not produce inflammatory changes in the gastric wall even after a lapse of years. The

<sup>1</sup> New York Medical Journal, 1903, vol. lxxviii. p. 110.

object of treatment should be to remove the foreign body promptly before such changes are produced.

**Hour-glass Stomach.** An hour-glass stomach is most likely to be mistaken for obstruction in the lower part of the œsophagus. Moynihan<sup>1</sup> says that a constriction in the cardiac portion of the stomach can be differentiated from constriction of the œsophagus by the introduction of a bougie. If the instrument passes more than sixteen inches the obstruction is probably in the stomach. If the constriction is near the pylorus the cardiac portion is dilated; but a correct diagnosis from pyloric stenosis can usually be made by Wölfler's first and second signs. The first sign is the inability of the examiner to recover as much fluid from the stomach as he pours into it through the stomach tube, some of it, of course, having passed the constriction into the pyloric pouch. The second sign is the regurgitation of dirty, offensive fluid from the pyloric to the cardiac portion of the stomach after the latter has been washed clean. Such regurgitated fluid may be obtained during the washing, or by passing the tube a second time a few minutes later.

A constriction situated near the cardia may be overlooked, unless the surgeon makes it a rule to examine the whole stomach at every operation upon it. Even when the condition is recognized, operative treatment may be difficult. The upper pouch may be anastomosed with the jejunum or with the lower pouch. If the latter operation is performed, the surgeon should be certain that the pylorus is not obstructed, or, if it is obstructed, he must also perform gastroenterostomy. If the stricture in the body of the stomach is due to malignant disease, partial gastrectomy is indicated.

Moynihan reports 15 operations upon hour-glass stomach, followed by 3 deaths.

**Volvulus of the Stomach.** Spivak<sup>2</sup> calls attention to the possibility of volvulus of the stomach. He has found such a condition to have been reported in literature eight times. In 2 of these cases the stomach was rotated 180 degrees or more around a vertical axis, forming a true volvulus like the volvulus of the intestine. In 3 cases the stomach was rotated on its longitudinal axis about 180 degrees, so that both cardiac and pyloric orifices were occluded. In 3 cases of hour-glass stomach one-half of the organ was so twisted or bent as to produce obstruction.

The symptoms of an attack are:

A sudden onset; distention beginning in the left hypochondrium and gradually increasing; a tumor, tympanitic on percussion; imme-

<sup>1</sup> Medical News, 1903, vol. lxxii. p. 1057.

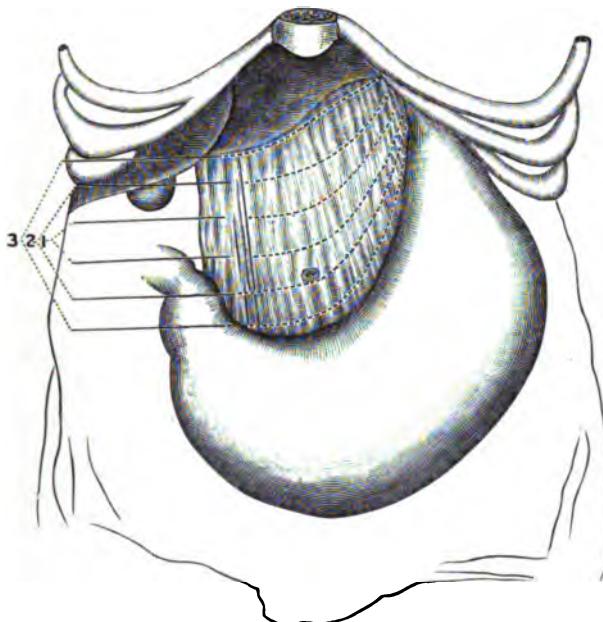
<sup>2</sup> American Medicine, 1903, vol. vi. p. 709.

diate regurgitation or vomiting of swallowed food or drink ; no belching nor escape of flatus ; absolute obstruction to the passage of a sound into the stomach.

If the condition is recognized early, operation gives a good chance for recovery, as shown by the cases quoted. In some of them it was necessary to incise the distended stomach and to empty it of some quarts of gas and water before reducing the volvulus.

**Cure of Gastrophtosis by Suture of the Gastrohepatic and Gastrophrenic Ligaments.** Beyea<sup>1</sup> has devised an operation for the relief

FIG. 20.



(1) Position of one suture of first row, (2) one of the second row, (3) one of the third row. Other sutures forming each row introduced at intervals along dotted lines.

of gastrophtosis which he considers far superior to the operations of Rovsing and others, all of which are based upon the principle of suturing the stomach to the anterior abdominal wall.<sup>2</sup> Such operations, according to Beyea, are likely to be followed by a good deal of pain, due to traction upon the adhesions. His plan is to insert one or more rows of sutures in the suspensory ligaments of the stomach, as shown in Fig. 20. These sutures are interrupted silk stitches inserted from above downward and from right to left through the gastrophrenic and

<sup>1</sup> Philadelphia Medical Journal, 1903, vol. xi. p. 257.

<sup>2</sup> PROGRESSIVE MEDICINE, 1900, vol. ii. p. 17.

**gastrohepatic ligaments.** They produce a broad transverse fold in these ligaments, and elevate the stomach to its normal position without disturbing the physiological mobility or functions of the stomach. Four cases are reported in which this operation was performed with satisfactory results. It so happened that all these patients suffered from gastrophtosis without relaxation of the abdominal walls or separation of the recti muscles. It is, therefore, not possible to say what the effect of the operation would be should these latter conditions exist.

**Carcinoma of the Stomach.** PROPHYLAXIS. Alexander-Katz<sup>1</sup> calls attention to the rarity of cancer in those portions of the intestine in which the contents are soft. He believes that gastric cancer would be found less frequently if the diet were restricted to soft foods and if more attention were paid to thorough mastication.

**OPERATION.** Robson,<sup>2</sup> while emphasizing the importance of an early diagnosis of cancer of the stomach, takes exception to the optimistic view of some surgeons, that when a tumor is palpable it is too late for operation. He cites fifteen cases in which he has performed various operations, and advocates early exploratory incision in order to complete or confirm the diagnosis. In the early stage of the disease such an exploration entails little risk, and in the later stages it is equally necessary in order to carry out radical or operative treatment. If the disease is too extensive for radical operation, gastroenterostomy may considerably prolong life, and add to the patient's comfort and happiness. He not only is freed from the distress due to painful peristalsis and the irritation of retained food and secretions, but he is freed from the toxæmia due to absorption of poisonous fermenting contents of the stomach. In a few cases the temporary improvement in health due to gastroenterostomy has made a subsequent radical operation possible. In other cases gastroenterostomy has shown the original diagnosis of carcinoma to have been erroneous.

If the disease involves the cardiac end of the stomach, and is too extensive for removal, gastroenterostomy may prolong the patient's life and prevent his death by suffocation.

If the stomach is so badly diseased that gastroenterostomy is impracticable, jejunostomy should receive consideration. This operation can be performed through the small incision necessary for exploration, and will relieve the patient of the retention of food and the pain caused by attempts at taking food by the mouth.

In suitable cases the radical removal of cancer of the stomach may bring about as much relief to the patient as does the operation for the

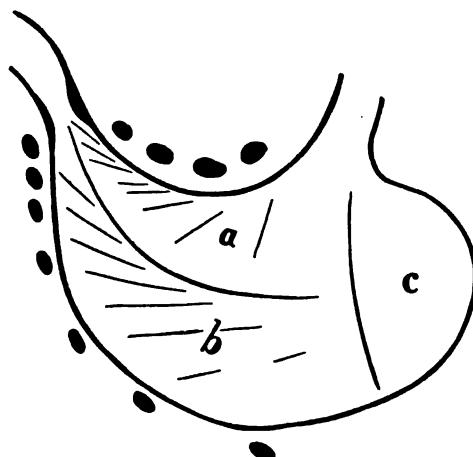
<sup>1</sup> Deutsche med. Wochenschrift, 1903, vol. xxix. p. 867.

<sup>2</sup> British Medical Journal, 1903, vol. i. p. 949.

removal of cancer of the breast, uterus, and other organs of the body.

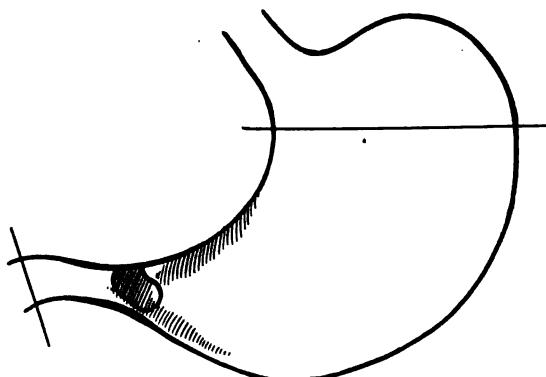
**PARTIAL GASTRECTOMY FOR CANCER.** Moynihan<sup>1</sup> has studied the position of cancer of the stomach, the probable direction and rate of

FIG. 21.



The lymphatic vessels and glands of the stomach. *c* is the "isolated area."

FIG. 22.



Showing the growth at the pylorus, the extensions along the curvatures, and the lines of incision in the stomach and duodenum.

its growth, and the lymphatic glands which are involved, in order to determine what portions of the stomach are most apt to require excision. He finds :

1. That malignant disease of the stomach begins in the majority of instances near the pylorus, just below the lesser curvature.

<sup>1</sup> British Medical Journal, 1903, vol. i. p. 955.

2. That from this point it spreads most rapidly and most widely in the submucosa.
3. That the rate of growth toward the cardiac orifice is rapid, toward the duodenal side extremely slow. The duodenum is rarely affected extensively.
4. That the tendency of the growth is to drift toward the curvatures.

FIG. 23.

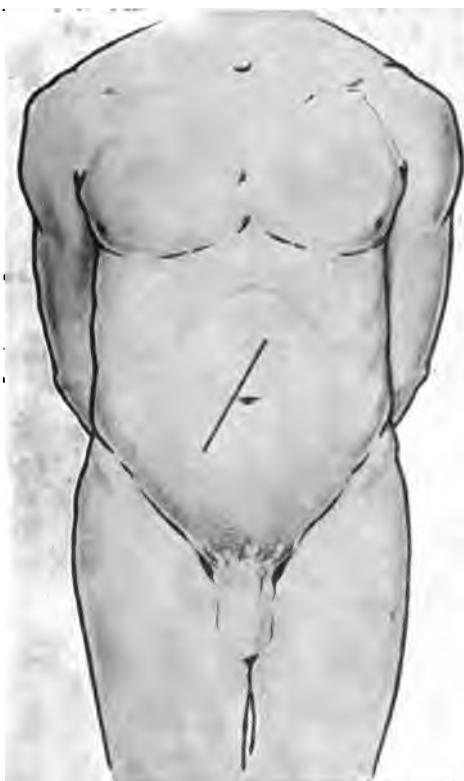


FIG. 24.

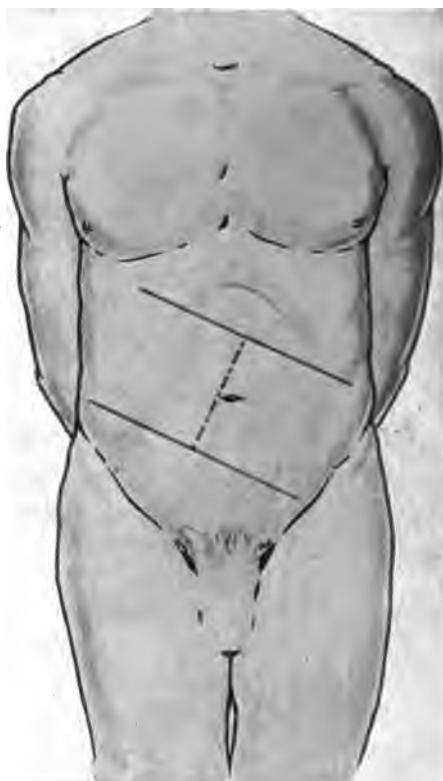


FIG. 23.—Showing approximately the line of the mesenteric root as traced on the abdominal wall. (For text see p. 69.)

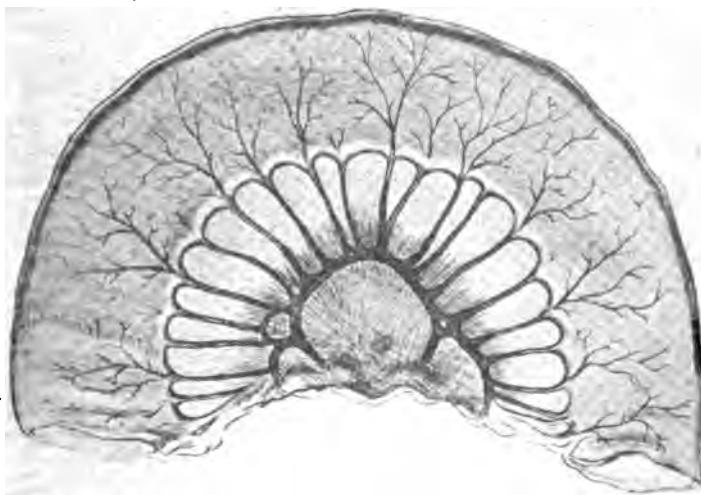
FIG. 24.—Showing the two oblique lines (black) drawn at right angles to the two extremities of the line (dotted) of the mesenteric root. The upper, middle, and lower compartments here indicated contain in most cases the upper, middle, and lower thirds of the small intestine respectively.

There are three chief lymphatic areas of the stomach, which are marked *a*, *b*, and *c* in Fig. 21. The third is called the "isolated area" by Moynihan, since it is rarely affected by cancer spreading upward by the pylorus. The lines of incision for a complete operation are shown in Fig. 22.

**Intestinal Localization.** Monks<sup>1</sup> has found by tests upon the cadaver, as well as by observations at operation upon the living, that intestinal localization is possible within two or three feet in the great majority of cases. The root of the mesentery is indicated by the oblique line in Fig. 23. If lines be drawn at right angles to its extremity they will divide the abdomen into thirds (Fig. 24), and in these thirds will be found the upper, middle and lower thirds of the small intestine.

An incision made in any one of these thirds will probably expose the corresponding portion of the small intestine.

FIG. 25.



A loop of intestine, the middle of which is exactly three feet from the end of the duodenum. The gut is of large size. The mesenteric loops are primary, and the vasa recta large, long, and regular in distribution. The translucent spaces (lunettes) between the vessels are extensive. Below, the mesentery is streaked with fat. The veins, which had a distribution similar to the arteries, are for simplicity omitted from this and from the subsequent drawings. (The subject from which the specimen was taken was a male, forty years of age, with rather less than the usual amount of fat. The entire length of the intestine was twenty-three feet.)

The upper portion of the small intestine has a greater diameter, a thicker wall, and a brighter color than the lower portion, and is abundantly supplied with valvulae conniventes. These can always be felt, and generally seen as pinkish or whitish rings. They diminish in number, and especially in size, with the distance from the duodenum. They can rarely be felt or seen in the lower third of the small intestine.

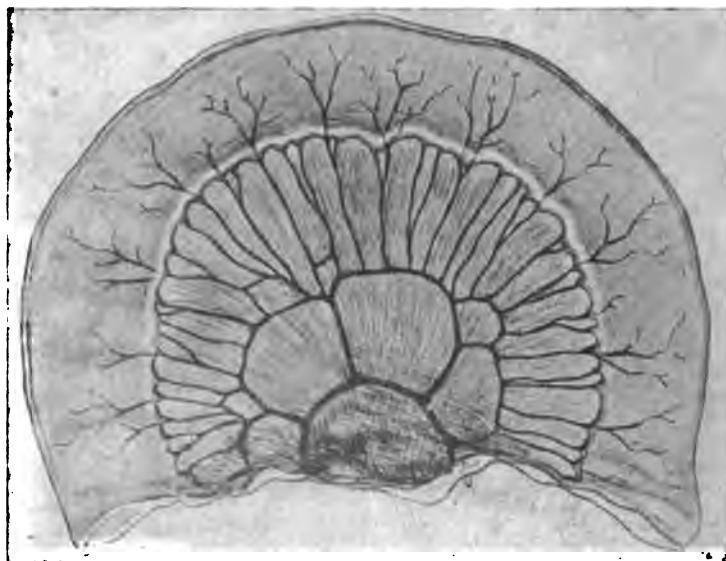
The arrangement of vessels in the mesentery is very significant, the

<sup>1</sup> Transactions of the American Surgical Association 1903, p. 405.

vessels are larger and form fewer loops near the duodenum. They are smaller and much more branched as one approaches the cæcum. There is also more fat in the mesentery in the lower portion of the small intestine. These differences are strikingly shown in Figs. 25, 26, and 27, which are drawings from the same subject.

It is often possible to determine the exact location of the root of the mesentery of a loop of bowel if one passes the finger down on the right or left side of the mesentery, and at the same time makes traction upon the loop. A further test of value is to seize either end of the loop

FIG. 26.

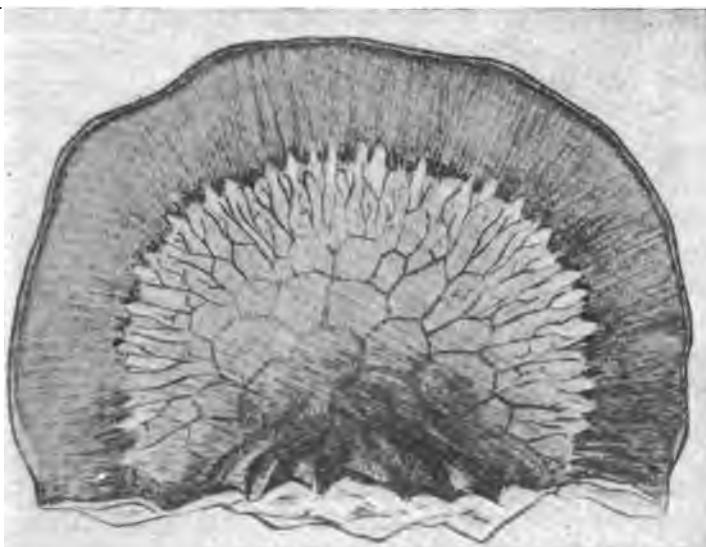


A loop of intestine at nine feet. The secondary vascular loops are large. The vasa recta are somewhat irregular and show branches. No lunettes are present, the mesentery is streaked with fat, and is therefore somewhat opaque. (The specimen was taken from the same subject which furnished Figs. 25 and 27.)

between the thumb and forefinger of either hand and to make alternate traction, first upon one end of the loop, and then upon the other. In this manner it is often possible to tell whether or not the loop is twisted. If it is not twisted its upper end is, of course, toward the duodenum and its lower end toward the cæcum. Monks found that a little practice in these tests enabled him to tell not only which end of the loop was uppermost, but also what portion of the small intestine presented in the wound. He believes if the attention of other surgeons is directed to this subject that intestinal localization will become fairly accurate.

**Diagnosis of Perforation of the Stomach and Intestine.** Connell<sup>1</sup> regrets that no advance has been made for a century in the diagnosis of perforation of the gastrointestinal tract. The only positive method of arriving at a diagnosis to-day is to perform exploratory laparotomy or await the development of peritonitis. The various attempts at an early and accurate diagnosis by the injection of hydrogen gas into the rectum, by auscultation, by counting the leukocytes, etc., have not proved sufficiently reliable to warrant their general adoption. Connell has conducted a series of experiments in order to determine whether

FIG. 27.



A loop of intestine at seventeen feet. The mesentery is opaque, and small tabs of fat begin to appear along the mesenteric border of the gut. The vessels are represented by a somewhat complicated network, and are seen with difficulty in the thick fat of the mesentery. (The specimen was taken from the same subject which furnished Figs. 25 and 26.)

sterile air and sterile salt solution injected into the abdominal cavity and after a few minutes withdrawn will give chemical reactions in cases of perforation. First, he convinced himself that such injections are harmless if no perforation exists. He found that injected air when withdrawn completely contained sufficient hydrogen sulphide to give positive reaction with lead acetate, iodized starch, and Nessler's reagent, and that salt solution injected and withdrawn after thirty minutes gave positive reactions to tests for ammonia, indol, and bile. These experiments, while by no means conclusive, are very suggestive, since

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xl. p. 828.

in many cases they showed perforation to exist some hours before the signs of peritonitis developed.

**Intestinal Peristalsis as a Diagnostic Sign.** Gaub<sup>1</sup> concludes, from experiments upon dogs and observations of men, that the presence or absence of intestinal peristalsis may be a valuable diagnostic sign after non-penetrating abdominal injuries. If there is a lesion of the gastrointestinal tract the peristalsis usually returns when the symptoms of shock subside, but the absence of peristaltic movement is not of itself sufficient to determine an operation. If peristalsis is present, and the pulse rises to 120 or higher, operation may still not be necessary. It should be performed if palpation and percussion show that an exudate is accumulating. If all means to prevent shock have been exhausted, and the pulse-rate is small and rapid, and peristaltic movement absent at the end of four hours, exploratory operation is justifiable. The facial expression and the presence of rigidity and tenderness may often be sufficient to induce operation at a still earlier date.

**Intestinal Obstruction.** FREQUENCY OF INTUSSUSCEPTION. Roth<sup>2</sup> is convinced that intussusception in children occurs much oftener than is generally supposed.

Erdmann saw four cases in a period of four weeks; Riddel saw three cases in a family of four children; and Rigby saw seven cases in nine weeks. These are exceptional instances, but they go to show that the disease is not so rare and that the symptoms should be kept in mind by every physician. The results of early operation are generally good. The disease usually attacks a healthy child. The onset is sudden. Sharp colicky pains are soon followed by vomiting at constantly decreasing intervals. The symptoms of shock are marked. There may be a discharge of bloody mucus from the rectum, or there may be no movement from the bowels. At first the abdominal wall is not rigid. A tumor may or may not be felt.

Attempts to reduce the bowel by injections of water should be made in the first twelve hours, if at all. Later they are not likely to succeed, and they may rupture the bowel. The syringe should not be more than three feet above the patient. Early operation gives the best chance for recovery.

**AN IMPROVED METHOD OF REDUCING AN INTUSSUSCEPTION.** Minchin<sup>3</sup> succeeded in reducing intussusception in a child of eight months by the following means:

The child was inverted, and the colon filled with hot water by

<sup>1</sup> Pennsylvania Medical Journal, 1903, vol. vi. p. 617.

<sup>2</sup> Medical Record, 1903, vol. lxiv. p. 965.

<sup>3</sup> Ibid., 1903, vol. lxiii. p. 586.

means of a rubber bulb syringe, resembling a Politzer inflation bag, and having a capacity of about four ounces. It was found possible to do this by pressing the syringe firmly into the anus during the child's efforts to expel the water, and then refilling the bulb when the paroxysm of straining passed over. Then, while manipulating the tumor through the abdominal wall with the left hand, the bulb was alternately compressed and relaxed, in much the same way as a plumber uses his suction bulb in clearing out a stopped-up sink pipe, and, after a little gentle manipulation in this manner, the tumor was felt to disappear under the fingers. The advantages of this procedure over the application of hydrostatic pressure by means of a fountain syringe are: the greater control which the operator has over the amount of force applied and the benefit of an intermittent rather than a continuous pressure.

This treatment is, of course, not intended to take the place of operation, and is recommended only at an early stage of the trouble.

**RESECTION FOR INTUSSUSCEPTION.** Von Mikulicz<sup>1</sup> operates as follows in case of extensive invaginations of the intestine when the intussuscepted gut is gangrenous and must be resected: The intussusception is drawn to the abdominal incision and stitched there, so as to prevent infection of the peritoneal cavity. The wall of this gut is then incised longitudinally for a sufficient distance (12 cm. in a case of ileo-colic invagination). This exposes the intussusception, which is composed of two tubes of intestine, one inside the other. If their vitality is destroyed they must be resected, and as their serous surfaces are in contact, the peritoneal cavity must be here protected from infection. This is accomplished by cutting through both intestinal tubes little by little, and stitching them together as fast as cut by catgut sutures, which penetrate all their coats. The mesentery will require multiple ligation. The invaginated intestine can then be extracted. The opening in the intussuscipiens should not be sutured, but should form an outlet for the feces. This artificial anus can be closed some weeks later. By this method peritonitis can almost certainly be avoided, and the mortality consequently reduced.

**PERITONITIS AND OBSTRUCTION.** Lund<sup>2</sup> believes that there are a certain number of cases of diffuse peritonitis in which death is due only in part to the septicæmia and in part to the intestinal paralysis and distention of the abdomen. If such distention comes on early, in the course of the disease before the patient is profoundly septic, it is probably due to fibrinous adhesions which obstruct the bowel by angu-

<sup>1</sup> Transactions of the American Surgical Association, 1903, p. 129.

<sup>2</sup> Journal of the American Medical Association, vol. xli. p. 74.

lation, possibly to thickening of the wall of the bowel by exudate. In mild cases the obstruction may be overcome by stimulation of peristalsis by turpentine enemata or glycerin and Epsom salts, and the use of the rectal tube. If these measures fail the obstruction may yet be overcome by enterostomy. This can be performed under a local anaesthetic. A distended coil of small intestine should be chosen in preference to the cæcum, as the distention is thus more perfectly relieved, and the resulting fistula, if the patient survives, is more easily closed than a fistula in the cæcum. An incision an inch long is made in the median line. The nearest coil of intestine is sutured in this opening. A large catheter is passed into the afferent part of the intestine. A little gas and fecal matter usually passes away, but a copious discharge will not usually pass for some hours; not until the intestinal muscles regain their tone. This dressing should be kept separate from the other laparotomy dressing by rubber tissue stuck to the skin with rubber plaster. In successful cases the pulse begins to fall in six or eight hours.

**TARDY POSTOPERATIVE OBSTRUCTION OF THE INTESTINE.** Eliot,<sup>1</sup> under the above title, refers to the cases of intestinal obstruction which develop some weeks or months after operation. The obstruction may be due to a cicatrix or kink or band, the great omentum often playing an important part. Symptoms may develop gradually or suddenly, but when obstruction is once established the progress of the case is invariably a rapid one, and, unless relieved by operation, death from necrosis of the intestinal wall and peritonitis may be expected.

Eliot lays stress upon prophylactic treatment. All manipulations in the abdominal cavity should be made with the utmost gentleness, and mechanical, chemical, and thermal irritation should be avoided. Needless ligatures should not be applied, and those used for the ligation of vessels and pedicles should be of catgut rather than of silk. Denuded stumps and other raw areas should be covered with adjacent peritoneum or omentum. The use of rubber tissue and cavigle membrane to prevent adhesions is still in the experimental stage. Drainage is imperative in suppurative cases, but the size of the drain and its material should be such as to produce the fewest possible adhesions. Eliot prefers a gauze drain wrapped in gutta-percha tissue. This he changes early, substituting, if possible, a smaller one.

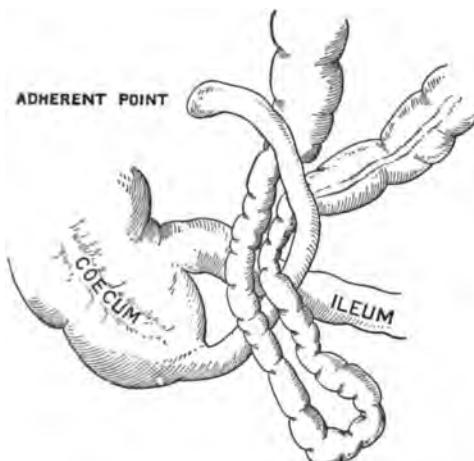
In the first twenty-four hours after operation large rectal saline enemas, with or without turpentine, are of service in hastening a normal action of stomach and bowels, and so they tend to prevent adhesions. As soon as nausea subsides, calomel and saline should be

<sup>1</sup> *Medical News*, 1903, vol. lxxxiii. p. 596.

given by mouth, and the position of the patient should be changed from time to time. Such measures are especially important after operations performed for infectious peritonitis, or upon the intestine, or under circumstances which make the formation of adhesions probable.

**INTESTINAL STRANGULATION SECONDARY TO APPENDICITIS.** Weir<sup>1</sup> mentions an instance of strangulation of intestine beneath a bridge caused by the adherent appendix. Fortunately operation was performed before the strangulated intestine had become gangrenous, so that the removal of the appendix was followed by a relief of all symptoms. The accompanying diagram shows how the strangulation occurred. (Fig. 28.)

FIG. 28.



Strangulated intestine from an adherent appendix.

**UNUSUAL CASES OF INTESTINAL OBSTRUCTION.** Bowlby<sup>2</sup> mentions a number of cases in which the symptoms of pain, vomiting, and obstruction to the passage of wind and feces suggested intestinal obstruction. One was a case of *appendicitis*, in which the chief symptoms were produced by intestinal stasis. Another was a case of *renal colic* with general abdominal pain, vomiting, and no movements from the bowels after enemata. This condition lasted twenty-four hours before the localization of the pain in the right lumbar region cleared up the diagnosis. Another was a case of *acute pancreatitis*, which proved fatal in three days. In this case there were the characteristic symptoms of a sudden attack of intense abdominal pain, collapse, bilious vomiting, and no movements of the bowels. The patient was a healthy woman, aged forty years. Another case was one of *fecal*

<sup>1</sup> Medical Record, 1903, vol. lxiii. p. 801.

<sup>2</sup> British Medical Journal, 1903, vol. i. p. 5.

*impaction* in a middle-aged woman of constipated habit. In cases of this class the severe pain of true intestinal obstruction is wanting, and the abdomen is soft and moves well on respiration. There is none of the anxiety which is so marked a feature in patients with real obstruction.

Bowlby also mentions several cases of obstruction from rare causes. A stout woman, aged sixty years, entered the hospital after four weeks of abdominal discomfort and flatulence and one week's constipation. The abdomen was moderately distended, and there was vomiting of foul-smelling yellowish fluid. The abdomen was opened on the left side under the supposition that the large intestine was obstructed. It was found to be empty, and there was no sign of peritonitis. The wound was therefore closed. Two days later, as there was still no movement from the bowels, the abdomen was reopened and the small intestine was examined, and an *impacted gallstone* found in a loop of small intestine, situated in Douglas' pouch and surrounded by omentum. Within a few hours acute diarrhoea supervened, and the patient became collapsed and died. The suture line was found secure at autopsy.

A middle-aged man was unloading coal trucks in exceedingly cold weather. The fingers of one hand became numb, and the next day were evidently gangrenous—a condition which was attributed to frost-bite. A few days later he suffered from abdominal pain, vomiting, and collapse. The abdomen was distended and tympanitic, and the bowels would not act after enema. In thirty-six hours he was dead. Nearly the whole of the small intestine was *gangrenous from an embolus*, which included the whole trunk of the superior mesenteric artery. There was also an embolus in the bifurcation of the brachial artery and secondary emboli in its digital branches. This explained the gangrene of the hand, which was attributed to frost-bite. The emboli came from an old clot in the left ventricle, due to endocarditis.

In two cases intestinal obstruction was brought on by *gross over-eating* in men who had *old adhesions* about the small intestine, due to previous peritonitis. The lumen of the bowel seemed sufficient for ordinary purposes, but was unequal to the unusual work of transmitting rapidly such a huge meal. One of these patients died without operation; in the other the condition was suspected, the abdomen was opened, the distended bowel was incised and emptied, sutured and replaced, and the patient recovered.

Bowlby gives the following rules of procedure in doubtful cases of obstruction when operation seems indicated :

1. Open in the middle line below the umbilicus, because most of the causes of obstruction will be found in the lower half of the abdomen.
2. Without allowing any intestine to escape examine first with two

or more fingers, or even the whole hand, the right iliac region, and pass from there toward the umbilicus to feel whether there are any adhesions there. It is in this right lower half of the abdomen that most of the causes of obstruction are to be found, for here are : (1) the appendix ; (2) intestinal diverticula, perhaps attached to the umbilicus or to the neighboring mesentery ; (3) the commonest site for volvulus, that is, the cæcum ; (4) the usual site for the lodgement of an impacted gallstone, that is, the lower part of the ileum ; (5) a common place for adhesions due to caseous mesenteric glands ; (6) the sites of inguinal, femoral, and obturator hernia. Further, if the obstruction be in the small intestine, it is in the right iliac fossa that undistended intestine will be found, and if this can be secured and traced upward it is the surest guide to the seat of obstruction.

3. Examine next the left iliac region and the pelvic region, the latter especially if the patient be a woman, for there, as additional causes of adhesions, may be inflamed ovaries or tubes or some uterine trouble with neighboring inflammations.

4. If no cause can be discovered, then either open a coil of distended intestine and suture it to the skin, if the patient be too ill to bear more ; or else decide to take the distended bowel out of the abdomen altogether, and if necessary open it, empty it, and suture it. It is only by so doing that the surgeon will be able to return it once he has decided to let it escape, and it is often only by so doing that he will find a deeply-seated obstruction.

**VOLVULUS OF THE SIGMOID.** Philipowicz<sup>1</sup> has found volvulus of the sigmoid flexure to exist in about one-third of ninety-eight cases of ileus. The mere torsion is less important than is the accompanying strangulation. Thus a torsion of 180 degrees, if tight, will obstruct the intestine more than a looser torsion of 360 degrees. Some patients were able to sustain a complete turn of the sigmoid for several days without serious injury of the intestine. In five patients Philipowicz was able to reduce the torsion by inserting the rectal tube without operative intervention. In others he succeeded in evacuating the contents of the twisted loop by this means ; but the flexure became redistended, showing that the torsion still persisted, and an operation became necessary. After reducing the torsion he always fastens the loop so that it cannot twist again.

**The Omentum as a Protective Covering.** The value of the omentum as a protective covering for injured abdominal organs is pointed out by Renzi and Boeri.<sup>2</sup> They found by experiments upon

<sup>1</sup> Archiv f. klin. Chirurgie, 1903, vol. lxx. pp. 679 and 897.

<sup>2</sup> Berliner klin. Wochenschrift, 1903, vol. xl. p. 773.

dogs that after ligation of the splenic artery or vein the omentum wrapped itself about the spleen and became adherent to it, and in part restored the circulation of blood through the organ. These experimenters tied both the splenic artery and vein of other dogs. The spleen became, of course, necrotic, but even then the omentum wrapped itself about the organ and protected the rest of the abdomen until disintegration and absorption of the spleen was complete in two or three months. In a similar way the omentum surrounds an injured kidney, and surrounds foreign bodies in the peritoneal cavity, often making them harmless.

**Ulcers of the Jejunum after Gastroenterostomy.** Peptic ulcer of the jejunum, due to contact of the unchanged gastric juice with the intestinal mucous membrane, only occurs after gastroenterostomy for benign conditions according to von Mikulicz.<sup>1</sup> This complication of gastroenterostomy has been noted about fifteen times by other German surgeons, and von Mikulicz has seen it in five additional cases. In all of these cases the anastomosis between the stomach and intestine was an anterior one, made according to Wölfler's method. The ulcer may appear almost immediately or not until some months have elapsed. The result may be immediate perforation into the peritoneal cavity, or, what is more usual, a gradual perforation through the wall of the intestine and the anterior abdominal wall, either in the site of the operative scar or through the left rectus muscle. The ulcer may be near the anastomosis or some distance away from the junction of the stomach and intestine. Similar ulcers have been observed to follow gastroenterostomy performed upon dogs. The moral is to perform pyloroplasty (Finney's modification) or gastroduodenostomy, or, if these operations are not feasible, to perform gastroenterostomy by von Hacker's posterior method.

**Peptic Ulcer in the Jejunum of a Dog following Gastroenterostomy.** Watts<sup>2</sup> records the occurrence of a peptic ulcer in the jejunum of a dog three months after an absolutely successful gastroenterostomy. There were two ulcers, one of which perforated, causing the death of the animal. This is well illustrated in Fig. 30.

A search through German literature revealed fourteen cases of peptic ulcer occurring in man as the result of gastroenterostomy. In ten cases the anterior operation was performed, in two the posterior, and in one the Y-operation of Roux. These figures would seem to indicate the greater risk of the anterior operations in this respect; but it must be remembered that this anterior operation has for some years been performed more frequently than the others mentioned.

<sup>1</sup> Transactions of the American Surgical Association, 1903, p. 127.

<sup>2</sup> Johns Hopkins Hospital Bulletin, July, 1903, p. 191.

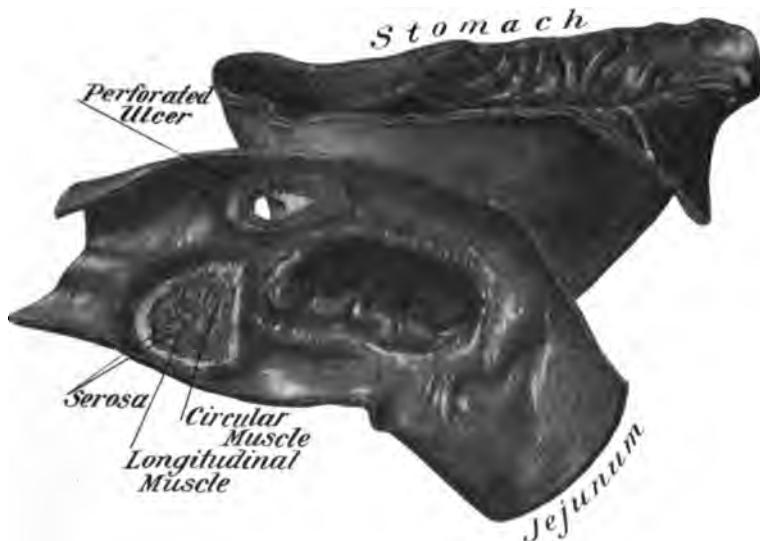
If ulcers occur equally often with either operation, the anterior or posterior, then the anterior is to be preferred, for in these cases the jejunum very readily becomes adherent to the anterior abdominal wall,

FIG. 29.



**Ulcer of the jejunum following gastroenterostomy for congenital stenosis of the pylorus.**

FIG. 30.



**Ulcers of the jejunum following gastroenterostomy in a dog.**

so that perforation of the ulcer often gives rise to localized abscess rather than general peritonitis. A review of the reported cases proves this to be true. In ten cases the anterior operation was followed by perforation, which led in three cases to general peritonitis, and in seven

cases to localized abscess. In both cases in which the posterior operation was done perforation was followed by general peritonitis.

**Surgical Treatment of Colitis.** Gibson<sup>1</sup> states that further experience with his method for the surgical treatment of colitis has confirmed the hopes expressed in regard to it when he published his paper in 1902. The object of operation is to establish a valvular artificial anus in the cæcum so that the patient may have the benefit of local treatment to the whole colon and be spared the annoyance of a discharging fecal fistula.

A small intermuscular incision is made over the *caput coli*. Then, reproducing the technique of the Kader gastrostomy, a catheter is introduced into the bowel through an opening just large enough to admit it. By using two tiers of sutures the tube is infolded into the cæcal wall, absolutely guaranteeing against any leakage, and the bowel is finally secured to the abdominal wall. Irrigations are begun in forty-eight hours. The tube is removed in a week. The infolded cone of the wall of the intestine will then effectually prevent any leakage. From two to four times a day the tube is introduced, and the colon flushed with saline solution, followed by a solution of nitrate of silver in gradually increasing strength. To obtain permanent closure of the fistula it is only necessary to omit the passage of the tube for several days.

Weir brings the appendix to the surface, and utilizes its lumen for the passage of the tube.<sup>2</sup> Gibson thinks this not so good a method, as the opening is too small, it has no valve, and must therefore be covered with a dressing, and it requires a subsequent operation for its closure.

Meyer<sup>3</sup> has a higher opinion of Weir's method, which he names appendicostomy. He employed it in the case of a woman aged fifty-three years, who suffered for two years from frequent bloody and painful evacuations of a foul odor. The appendix was brought to the surface of the abdomen and immediately opened in order to test its patency. It admitted a No. 12 F. flexible bougie. If its lumen had been obliterated Gibson's colostomy would have been performed. The result of the operation was most satisfactory. Irrigations were easily carried out, and the patient's health rapidly improved. The tube is constantly worn. There is no leakage when it is in place or when it is removed. When the tube is left out the fistula rapidly contracts, and apparently will close spontaneously. If not it will only be necessary to cauterize its mucous lining in order to effect a cure.

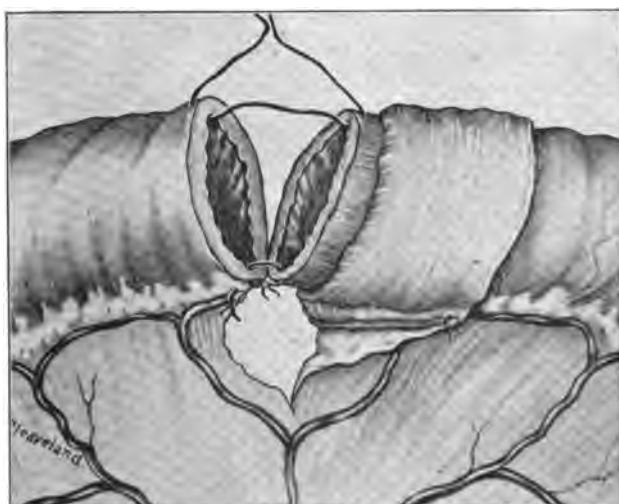
<sup>1</sup> Medical Record, 1903, vol. lxiv. p. 415.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1903, p. 86.

<sup>3</sup> Medical News, 1903, vol. lxxxii. p. 1203.

**Prolapse of the Intestine in Artificial Anus.** Geraud<sup>1</sup> says that a large abdominal opening is the common cause of prolapse of the intestine in artificial anus. Either the whole intestine or simply mucous membrane may protrude. In simple cases the prolapsed portion is soft and easily reducible. In chronic cases it may become ulcerated and so thickened that its return is impossible. The patient should avoid prolapse by a light diet, moderate exertion, defecation, without straining, in the horizontal position, and above all by the use of a support which will permit the escape of gas while preventing the escape of fecal matter or of the intestine. If the intestine can be reduced the

FIG. 31.



A cuff of serosa and muscularis with the mesentery is rolled back on the distal end of the bowel by means of gauze dissection. The denuded area is severed at the distal end within one centimetre of the cuff, and at the proximal end flush with the primary incision.

gap in the abdominal wall may be narrowed by suture. If only mucous membrane is prolapsed it should be excised, and the edges of the wound sutured. If the whole thickness of the bowel is prolapsed and cannot be reduced it should be cut away, and the stumps treated by Gasset's method.

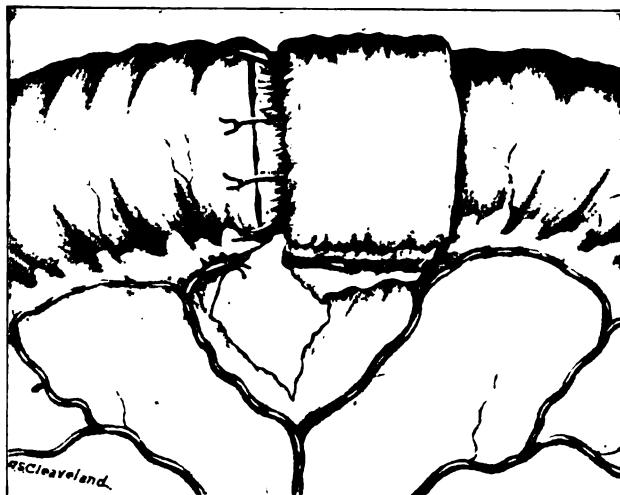
**Circular Enterorrhaphy by the Single Cuff Method.** Campbell<sup>2</sup> takes up a cuff of serous membrane and then utilizes it to cover the suture line in circular enterorrhaphy. This modification in the technique is easy of accomplishment, and does not greatly prolong the

<sup>1</sup> Revue d. Chirurgie, 1903, vol. xxviii. p. 190.

<sup>2</sup> Journal of the American Medical Association, 1903, vol. xl. p. 1487.

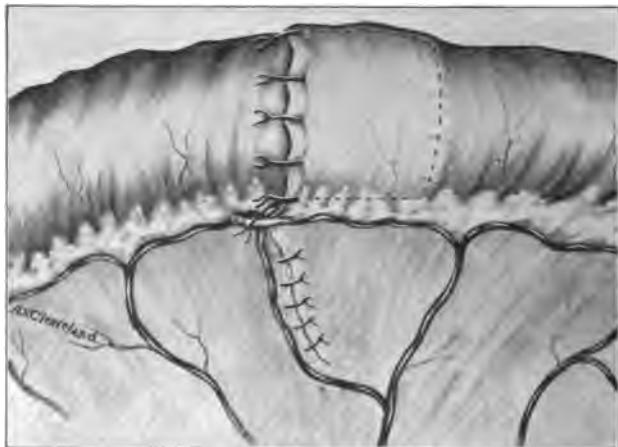
operation. The cuff covers and protects the suture line so that leakage and infection are obviated. Furthermore, it favors union by protecting

FIG. 32.



Eight through-and-through sutures are placed through the proximal end of the bowel and the denuded stump of the distal end.

FIG. 33.



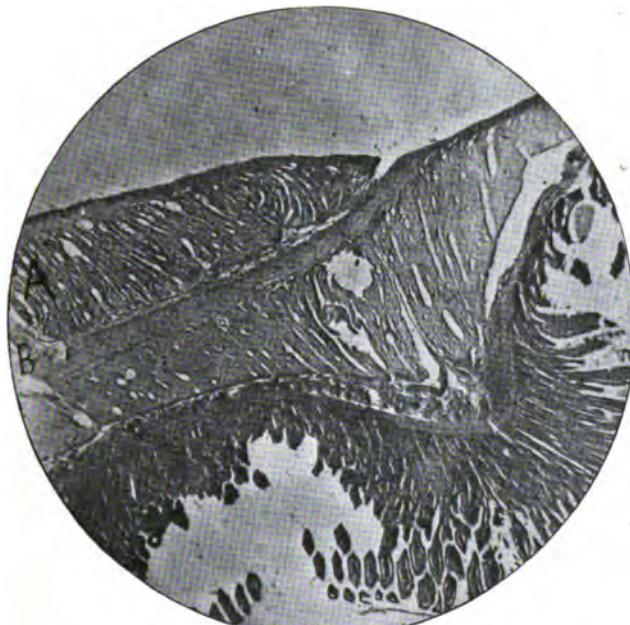
Cuff sutured in place ; mesentery sutured.

the blood supply of the sutured intestine. It requires no especial skill in technique. The cuff, consisting of the serous and muscular coats, is rolled back by means of gauze dissection on the distal portion of the

bowel. The divided bowel is then severed within 1 cm. of the reflected cuff. (Fig. 31.) Eight through-and-through sutures are then employed and united to two intestinal ends. The knots of these sutures are all placed within the bowel. (Fig. 32.) The cuff is then rolled over the suture line and made secure by a suture passed through the mesentery close to the bowel, and several interrupted sutures are passed through the cuff and the serous and muscular coats of the intestine which it covers. The mesentery is also sutured. (Fig. 33.)

Campbell has employed this suture in seventy-five primary operations upon dogs, with a mortality of 4 per cent. The period of recovery

FIG. 34.



Section of the line of union by the cuff method; dog's intestine.

was in every case unusually brief. He has also twice employed this method of intestinal suture in patients, one of whom recovered without difficulty; the other suffered from chronic obstruction due to tuberculous peritonitis. She was in bad condition at the time of operation, as the intestine had perforated in two places. About six inches were resected and the ends sutured in accordance with this method, the resection occupying about ten minutes. Unfortunately, the intestine was torn in an attempt to break adhesions, and a second resection of about four inches was necessary. The patient died in thirty-six hours. No autopsy was permitted.

The result of union by this method of suture is shown in Fig. 34.

**Intestinal Resection.** "Mechanical means *versus* the suture in intestinal anastomosis" is a question often debated pro and con. There are probably a few situations in which Murphy's button or some other mechanical appliance will always be preferable to suture, but the tendency on the part of many surgeons seems to be to familiarize themselves with some simple method of suture and to trust to it rather than to any artificial means of union. Dunn<sup>1</sup> reports nine cases of intestinal anastomosis by means of Murphy's button, with three deaths. One of these patients was clearly in an inoperable condition. The deaths of the other two might perhaps have been avoided had suture been employed.

He reports seven cases of intestinal anastomosis by suture, with one death from collapse within an hour. In conclusion Dunn says:

1. Suture is the most indispensable and generally applicable method of anastomosis in intestinal resection.

2. The Murphy button is equally useful, if not preferable, under certain conditions, but very inferior under others. For the end-to-end union of segments of normal small intestine, or the end-to-side anastomosis of healthy small and large bowel, it gives results unexcelled by any other method. In unions of the larger intestine it is so far inferior to suture as to be practically contraindicated. Pathological changes in the small intestine or its mesentery which render the perfect application of the button difficult, or such as would probably disturb the course of healing, should be united by suture.

3. Of suture methods that of Gregory F. Connell is incomparably the best; is, in reality, the simplest; a single row of continuous suture, all within the gut, the most likely to be even, strong and tight, with the smallest and most even diaphragm, admits of the easiest and most perfect dealing with the mesenteric border, and is capable of a simple invariable technique.

4. It is especially desirable to choose the fewest and simplest means compatible with the best work, because intestinal operations occur at rare and irregular intervals as emergencies in the hands of many surgeons, and the little conveniences which enter into highly specialized operations of repeated daily execution are for the most part worse than impracticable.

**THE SAFETY OF THE MURPHY BUTTON.** Neuweiler<sup>2</sup> gives a careful review of the literature of this much-discussed question. He says that perforation resulting from the use of the button is likely to occur after enteroanastomosis following incarcerated hernia in certain gastroen-

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xl. p. 1491.

<sup>2</sup> Archiv f. klin. Chirurgie, 1903, No. 4, Band lxix. p. 740.

terostomies, and particularly after ileocolostomy of the circular type. Perforation may be due to a poor button or faulty technique. In strangulated hernia the blame lies in the infected condition of the parts. Consequently perforation may follow resection and suture in these cases.

He gives the following rules for the safe use of the button : 1. All exposed edges and holes of the button must be evenly rounded off. 2. The opening between the cylinder and ring of the female half must be wide enough to admit a thick intestinal wall. 3. The cylinder of the female half must be shorter than that of the male half, so as to permit of perfect interlocking. 4. The spring must give a continuous even pressure. 5. The size of the button must be proportioned to the lumen of the gut.

If the purse-string suture is too far from the edge of the intestine, the cuff thus formed may interfere with the closure of the button ; if it is too near the edge, it may tear out. The proper distance is 2 mm. to 3 mm. (one-eighth inch). In circular anastomosis care should be taken to approximate the serous surfaces at the mesentery. Protruding mucous membrane should always be trimmed away. In pushing the halves of the button together the fingers should be so placed that the intestine is not pressed against edges of the button. A protecting line of sutures is recommended in most cases.

A SAFE METHOD OF RESECTION IN CASES OF MALIGNANT TUMOR OF THE INTESTINE. Von Mikulicz's<sup>1</sup> method of resection in cases of *sarcoma of the large intestine* is perhaps not as well known as it ought to be. In principle it is an extraperitoneal operation. He makes his abdominal incision, removes the affected lymphatic glands, frees the portion of the intestines which is to be resected, and brings it completely out of the wound. He then stitches it to the incision in the peritoneum and partially closes this incision. Not until the peritoneal cavity has been thus completely closed does he resect the affected portion of intestine. The patient is thus left with an artificial anus, which is closed by suture in a few weeks. This is, of course, an annoyance, but it is more than counterbalanced by the lessening of the risk of operation. He has treated in this manner twenty-four patients, with twenty recoveries. Only one of the four deaths was due to peritonitis, and that was brought about by the rupture of the intestine during its enucleation. When one compares these figures with the usual mortality of 30 or 40 per cent. the advantage of this method of operating is apparent.

RESECTION OF LARGE INTESTINE. Paul says that nearly all cases of chronic stricture of the large intestine are first diagnosed as gastric

<sup>1</sup> Transactions of the American Surgical Association, 1903, p. 132.

<sup>2</sup> British Medical Journal, 1903, vol. i. p. 353.

derangement because there is dyspepsia and sometimes vomiting of food. The colic is often overlooked until obstruction occurs. If the growth can be palpated diagnosis ought not to be difficult. If resection is postponed until obstruction is present the risk is greatly increased. This is due partly to the absorption of toxins from the paralyzed bowel, and partly to the added difficulties of the operation when distension is present. As the cut end of the colon sometimes sloughs, Paul believes in bringing the ends of the bowel out of the abdomen and establishing a temporary artificial anus. Later he divides the spur between the two ends of bowel by means of a spring compressor, which produces a slough in twenty-four to forty-eight hours. Enlarged mesenteric glands in the vicinity of the growth do not mean an absolutely hopeless prognosis, as two of his patients are in good health, one two and a half years after operation, and the other four and a half years after operation. In both of these patients there were enlarged mesenteric glands.

Goeschel<sup>1</sup> advocates resection of the large intestine in several sittings. He reports four cases in which he employed this method with success. In one case resection was performed for *carcinoma of the cæcum*, and in another for *carcinoma of the colon*. In a third case resection was performed for stenosis of the colon due to a hemorrhagic infarct, and in a fourth for tumor of the cæcum and appendix secondary to tumor of the adnexa. He recommends the continuous bath as a valuable aid in the after-treatment.

**Perforation in Typhoid Fever.** Four articles recently published add to our knowledge of typhoid perforation. Mackenzie<sup>2</sup> writes of the signs by which one may make an early diagnosis. Abdominal pain is the most important sign. It may be accompanied by vomiting, nausea, hiccough, repeated action of the bowels at short intervals, rigors, swelling, or mental excitement; or the usual symptoms of intestinal perforation may be present. The temperature may suddenly rise or drop, but not always. The pulse may become more rapid and weaker, but not always. The face may be drawn, absence of liver dulness is an uncertain sign. Pain and abdominal rigidity are the most reliable signs of perforation. If there is no tenderness in the lower abdomen, if the abdominal walls are flaccid, if liver dulness is present and the flanks are normal, one may rest assured that there is no perforation.

Millspaugh<sup>3</sup> mentions a case of supposed typhoid perforation in which the symptoms were due to diaphragmatic pleurisy or subsequent pneumonia; and another in which no perforation existed, but in which

<sup>1</sup> Beiträge zur klin. Chirurgie, 1903, Band xxxvii. p. 486.

<sup>2</sup> Practitioner, January, 1904.

<sup>3</sup> Southern California Practitioner, January, 1904.

there was emphysema of the face, neck, chest, and arms, and a gas bacillus was isolated from the tissues.

Two exhaustive articles on the treatment of typhoid perforation by operation appeared almost simultaneously in France and in this country. Cazin's<sup>1</sup> list of 358 cases includes Keen's of 158 and several lesser lists. The mortality of the whole list is 70 per cent. Only 49 of the patients mentioned were operated upon by French surgeons, and 9 of them recovered, a mortality of 82 per cent. Cazin gives American surgeons the credit of being the leaders in this field. There were 48 successful cases in which the hour of perforation was mentioned, and in 38 of these operation was performed within twenty-four hours thereafter. There are, however, well-authenticated instances of successful operation after a lapse of forty-eight and even seventy-two hours. Such delay, however, increases the risk enormously.

Harte and Ashhurst<sup>2</sup> state that perforation occurs in about 2 per cent. of the cases of typhoid fever, and that the site of perforation is within twelve inches of the cæcum three times out of four. They give the mortality after operation as 74 per cent. in 362 cases, but this high mortality is no argument against operation, as a patient rarely or never recovers from perforation without operation.

Most surgeons prefer a general to a local anaesthetic. Very little of the anaesthetic is required. Rapidity of operation is desirable. A right lateral incision has generally been employed. The writers of both articles object to excision of the ulcer, as a waste of time is an increase in the magnitude of the operation. The ulcer should be simply turned into the gut by one or two rows of suture with fine black silk. Harte and Ashhurst prefer a row of mattress sutures parallel to the long axis of the gut, crossing the longitudinal Peyer's patch at right angles. A second row of Lambert sutures, likewise applied longitudinally but continuous, is also employed. Escher advocates suturing the edges of the perforation to the abdominal incision in order to prevent occlusion of the bowel; but the danger is more imaginary than real, as shown by the history of the patients who have been treated by suture of the perforation.

If diffuse peritonitis is present, as is usually the case, the abdominal cavity should be flushed with gallons of hot saline solution, introduced through a large glass tube to every portion of the cavity. This is one of the reasons why a general anaesthetic is preferable. The douching should be continued until the return fluid is perfectly clear. Gauze drainage is indicated, and any suspicious but not yet perforated portions of the bowel should be walled off by gauze.

<sup>1</sup> La Semaine Médicale, vol. xxiv. p. 1.

<sup>2</sup> Annals of Surgery, January, 1904.

Intravenous injection is often advantageous. Nourishment should be by rectum for three or four days at least, but hot water may be given by mouth in teaspoonful doses after twenty-four hours.

The gauze drains should be removed with the utmost gentleness after three days or longer. They should be well soaked with saline or dilute peroxide of hydrogen solution before they are pulled upon. If they are removed too early and not in part replaced an abscess may form, and if left in too long the resulting sinus will heal slowly. Recovery is sometimes delayed by a fecal fistula, but this almost always heals spontaneously.

In doubtful cases exploratory laparotomy should be performed, as this need not be the cause of death if rightly carried out, and if perforation is found to exist it may save the patient's life.

### THE APPENDIX.

**A New Incision through Which to Reach the Appendix.** Beer<sup>1</sup> recommends an incision for appendicitis directly above the line drawn from the umbilicus to the middle of Poupart's ligament. This incision is about half an inch to the inner side of the outer border of the rectus muscle. The muscle is pushed inward, exposing the inferior epigastric artery. The peritoneal cavity is opened just external to this artery. Beer believes that this incision reduces to a minimum the risk of subsequent hernia.

**Epidemics of Appendicitis.** French surgeons are inclined to look upon appendicitis as epidemic and an infectious disease. Lucas-Championnière so considers it, and says that it is especially prevalent in England and the United States. Charin has published the results of a series of laboratory experiments entitled "A Report on Experimental Epidemic Appendicitis." Dieulafoy finds that in appendicitis, as in other infectious diseases, there occur icterus, acute nephritis, multiple arthritic inflammations, etc.; he even observed in two cases enlarged spleens. This writer draws the following conclusions: 1. Appendicitis is an infectious disease. 2. In many cases appendicitis appears as a primary, independent affection of the appendix, in the way that tonsillitis represents an inflammation of the tonsils. 3. During the last eight to ten years the number of cases of appendicitis has increased progressively, taking the character of an epidemic, or even endemic prevalence. 4. This prevalence is of a distinct, undoubted nature, as observed by Sonnenburg in 1899 in certain localities in Berlin and Frankfort.

**Condition Simulating Appendicitis.** Kuttner<sup>1</sup> mentions some of the conditions which produce symptoms similar to those of appendicitis. Distention of the ileocecal region by gas, colic due to intestinal parasites, and circumscribed contraction of the rectus muscle may mislead the physician in his diagnosis. He believes that the curative effect of many operations for the removal of an appendix which is histologically healthy is due to the division of certain nerve trunks or to the rest in bed, change of diet, and suggestion.

**The Mortality in Appendicitis.** Ochsner<sup>2</sup> believes that the mortality in appendicitis may be reduced to a minimum by giving no food, drink, or medicines by the mouth during the acute attack, and by operating promptly in the acute attack, or in the interval between attacks. His views, which are based upon a very extensive clinical service, are as follows :

1. The mortality in appendicitis results from the extension of infection from the appendix to the peritoneum, or from metastatic infection from the same source.
2. This extension can be prevented by removing the appendix while the infectious material is still confined to this organ.
3. The distribution or extension of the infection is accomplished by the peristaltic action of the small intestines.
4. It is also accomplished by operation after the infectious material has extended beyond the appendix and before it has become circumscribed.
5. Peristalsis of the small intestine can be inhibited by prohibiting the use of every form of nourishment and cathartics by mouth, and by employing gastric lavage in order to remove any existing food or mucus from the stomach.
6. The patient can safely be nourished during the necessary period of time by means of nutrient enemata.
7. In case neither food nor cathartics are given from the beginning of the attack of acute appendicitis and gastric lavage is employed, the mortality is reduced to an extremely low percentage.
8. In cases which have received some form of food and cathartics during the early portion of the attack, and are consequently suffering from a beginning diffuse peritonitis when they come under treatment, the mortality will still be less than 4 per cent. if peristalsis is inhibited by the use of gastric lavage and the absolute prohibition of all forms of nourishment and cathartics by mouth.
9. In this manner very dangerous cases of acute appendicitis may be changed into relatively harmless cases of chronic appendicitis.

<sup>1</sup> Beiträge klin. Chirurgie, 1903, Band xxvii. p. 203.

<sup>2</sup> Medical News, 1903, vol. lxxxii. p. 833.

10. In my personal experience no case of acute appendicitis has died in which absolutely no food of any kind and no cathartics were given by mouth from the beginning of the attack.

11. The mortality following operations for chronic appendicitis is exceedingly low.

12. Were peristalsis inhibited in every case of acute appendicitis by the methods described above—absolute prohibition of food and cathartics by mouth and use of gastric lavage—appendectomy during any portion of the attack could be accomplished with much greater ease to the operator and correspondingly greater safety to the patient.

He gives these suggestions for the treatment of appendicitis, with a view of reducing the mortality :

1. Patients suffering from chronic recurrent appendicitis should be operated during the interval.

2. Patients suffering from acute appendicitis should be operated as soon as the diagnosis is made, provided they come under treatment while the infectious material is still confined to the appendix, if a competent surgeon is available.

3. Aside from insuring a low mortality, this will prevent a series of complications.

4. In all cases of acute appendicitis without regard to the treatment contemplated the administration of food and cathartics by mouth should be absolutely prohibited.

5. In case of nausea or vomiting or gaseous distention of the abdomen gastric lavage should be employed.

6. In cases coming under treatment after the infection has extended beyond the tissues of the appendix, especially in the presence of beginning diffuse peritonitis, suggestions 4 and 5 should always be followed until the patient's condition makes operative interference safe.

7. In case no operation is performed neither nourishment nor cathartics should be given by mouth until the patient has been free from pain and otherwise normal for at least four days.

8. During the beginning of this treatment not even water should be given by mouth, the thirst being quenched by rinsing the mouth with cold water and by the use of small enemata. Later small sips of very hot water frequently repeated may be given, and still later small sips of cold water. There is danger in giving water too freely.

9. All practitioners of medicine and surgery, as well as the general public, should be impressed with the importance of prohibiting the use of cathartics and food by mouth in cases of acute appendicitis.

10. It should be constantly borne in mind that even the slightest amount of liquid food of any kind given by mouth may give rise to dangerous peristalsis.

11. The most convenient form of rectal feeding consists in the use of one ounce of one of the various concentrated liquid predigested foods in the market, dissolved in three ounces of warm normal salt solution introduced slowly through a soft catheter, inserted into the rectum a distance of two or three inches.

12. This form of treatment cannot supplant the operative treatment of acute appendicitis, but it can and should be used to reduce the mortality by changing the class of cases in which the mortality is greatest into another class in which the mortality is very small after operation.

Mayo<sup>1</sup> takes this position : If the patient is seen within forty-eight hours he should be operated upon at once. The sooner the operation is performed the safer it will be. If more than forty-eight hours have elapsed and there is reason to believe that the inflammation is still confined within the appendix, and the patient is still in a reasonably good condition, operation should be performed. If, when the patient is first seen, this favorable stage has gone by and there are tympanites, vomiting, and quickened pulse, the surgeon should realize that the septic material has spread from the appendix to the general system. Therefore removal of the appendix will not at once remove the septic symptoms, and operation performed at this stage will have a considerable mortality. These are the patients who should be put upon the plan of treatment recommended by Ochsner. In a few days the majority of them will be in a much better condition for operation, so that the operative mortality will not exceed 4 per cent.

Murphy<sup>2</sup> believes that the class of cases in which Ochsner's plan of treatment is applicable is a small one, and one which will grow smaller as advantages of immediate operation at an early stage are more widely understood. It is unfortunate that some physicians have misinterpreted Ochsner's opinion and have applied his plan of treatment to patients seen within twenty-four to forty-eight hours.

Gibbons<sup>3</sup> cites an instance in which he was called to see a girl aged sixteen years, who had been suffering for some days from an unrecognized attack of appendicitis. The abdomen was enormously distended and the patient was more or less septic. A rigid nursing surveillance was established, nothing was given by mouth, the patient being nourished by rectum. Under this treatment the distention subsided, the inflammatory exudate was much reduced, and the prospects of a successful operation were good. But, deluded by the temporary improvement, the patient and her friends absolutely refused opera-

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xli. p. 546.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

tion, the septic symptoms returned with increased severity, and death occurred on the forty-first day of the disease.

Matthews<sup>1</sup> is a strong advocate of Ochsner's method of treating appendicitis. If the attack has lasted more than forty-eight hours he washes out the stomach and administers food by rectum until the acute symptoms disappear. Then he removes the appendix. He cites statistics to show how successful his plan of treatment has been.

**Pain in Appendicitis.** Moullin<sup>2</sup> calls attention to the fact that the abdominal organs are largely insensible to pain, so that the absence of pain is no proof that inflammation of the appendix does not exist. The first pain in appendicitis is usually referred to the umbilicus, and is due to a drag upon the posterior abdominal wall, brought about by peristaltic action in the cæcum or appendix. This is especially likely to occur when adhesions are present. If the pain becomes less, while the general condition of the patient does not improve, it is safe to assume that the inflammation has spread to the muscular coat of the bowel and lessened the peristaltic action. Local pain is due to the spread of the inflammation from the appendix to the parietal peritoneum or post-peritoneal cellular tissue. These are the only structures in the vicinity capable of giving the sensation of pain. This local pain usually develops before the umbilical pain entirely ceases. The absence of local pain is no counterindication to operation. The presence of severe local pain implies that the inflammation is either widespread or intense. There is usually a deep tenderness. There is often in addition a marked cutaneous hypersensitiveness, showing that the corresponding spinal centre is unduly stimulated. The sudden cessation of this hyperæsthesia without improvement in the general symptoms suggests gangrene and immediate operation.

### THE LIVER AND BILIARY PASSAGES.

**Anatomy of the Region of the Gall-bladder.** Brewer<sup>3</sup> says that it is important for the surgeon who operates in the region of the gall-bladder to know (1) the position of the nerve trunks in the abdominal wall; (2) the normal position, size, shape, and relations of the gall-bladder and ducts; their blood supply and the normal position of certain constant lymph nodes; (3) the most frequent variations from the normal in these structures, both congenital and acquired; (4) variations in the blood supply of the liver and gall-bladder; (5) the relations of the duodenal orifice of the common duct, and (6) the anatomy of the infrahepatic peritoneal basin.

<sup>1</sup> Texas Medical Journal, July, 1903.

<sup>2</sup> Lancet, 1903, vol. i. p. 514.

<sup>3</sup> Medical News, 1903, vol. lxxxii. p. 821.

Any incision which freely exposes the gall-bladder and ducts must divide one or more of the intercostal nerves; but careful dissection of ten subjects has shown that only a single nerve, namely, the ninth intercostal, will be injured by a straight incision through the rectus muscle near its outer border, extending from a point 1 cm. (one-half inch) below the free border of the eighth costal cartilage to a point 5 cm. (two inches) above the umbilicus, or by a curved incision parallel to the free border of the costal cartilages, extending from a point just below and outside of the ensiform cartilage, and carried downward and outward to a point above the emergence of the tenth nerve—viz., 1 cm. (one-half inch) above the tip of the eleventh rib.

Either of these incisions exposes sufficiently the gall-bladder. If it is necessary to expose the ducts or duodenum, the upper end of the straight incision mentioned should be extended obliquely toward the median line, and its lower end obliquely outward and downward (Bevan's S-incision).

From one hundred measurements Brewer gives the average length of the gall-bladder as 10 cm. (four inches), of the cystic duct 3 cm. (1.2 inches), and of the common duct 7.5 cm. (three inches).

There is a lymph node at the inner side of the neck of the gall-bladder just above the origin of the cystic duct, a second one in the angle of junction of the cystic and hepatic ducts, and a third on the outer side of the common duct where it passes below the duodenum. Enlargement of the first mentioned may occlude the cystic duct, and enlargement of either of the others may cause obstruction to the flow of bile.

Quénau says that the gall-bladder is occasionally absent and occasionally misplaced. Brewer found it in all of one hundred subjects examined. No variations in position were noted except such as were accounted for by the peritoneal attachment of the gall-bladder or by inflammation. In 5 per cent. of the subjects there was a distinct fold of peritoneum (a meson) between the bladder and the liver.

The cystic duct is probed with difficulty on account of the valvular arrangement of the mucous membrane. No such difficulty exists in passing a probe into the hepatic and common ducts. The probe passed the cystic duct easily in only 10 of 97 subjects examined, and in 5 of the 10 the gall-bladder contained calculi. Only 7 of the remaining 87 subjects had calculi in the gall-bladder.

Careful dissection of fifty subjects showed that the text-book description of the arterial supply of the liver, gall-bladder, and duct rarely exists; that the right or free extremity of the gastrohepatic omentum frequently contains a large number of small arterial branches derived from sources other than the main branch of the hepatic; and that

branches often accompany and even wind around the common duct. Important arterial trunks and branches were found to the outer side of the cystic and common ducts in 34 per cent. of the subjects examined.

The duodenal papilla may be located by passing the forefinger of the left hand obliquely inward and backward into the descending portion of the duodenum. There is a fold of mucous membrane in the posterior wall of the duodenum at the junction of the ascending and descending portions. The papilla is 2.5 cm. to 3 cm. (one inch) below this fold, so that when the second phalanx of the finger rests on this fold the tip of the finger rests on the papilla.

**Cholelithiasis. Diagnosis.** Murphy,<sup>1</sup> who has had personal experience in 324 cases of disease of the gall-bladder and biliary passages, insists upon the necessity for exact diagnosis. The classical symptoms of colic, nausea and vomiting, local sensitiveness and jaundice appear in the order mentioned and disappear in a few days in many cases of *cholelithiasis*. A more careful study of these symptoms will enable the observer to carry his diagnosis still farther. The accompanying chart (on the opposite page) is useful in the diagnosis of cholelithiasis.

The pain may be (1) of an inflammatory or infective type, accompanied by involuntary contraction of the overlying abdominal muscles; or (2) of an aching, cumulative, tension type, which is not guarded by constant traction of the abdominal muscles, but by a sudden muscular contraction when pressure is made. This is best shown when pressure is applied beneath the right costal arch and the patient makes an effort at deep inspiration. The pain may be (3) of the referred type. In obstructions of the pelvis of the gall-bladder, or the cystic duct, the pain is usually referred to the right subscapular region. In about one case in ten it is referred to the left subscapular region, and in about two cases in ten to some other portion of the left side. In all cases there is local pain in the region of the gall-bladder.

The word "colic" is used in this connection to indicate rapid, intermittent, or remittent spasmodyc pain. It occurs when a foreign body is passing through a canal the lumen of which is normally of small diameter. It is never due to overdistention of the gall-bladder, nor to retention of bile or mucus under pressure. Nor is it due to inflammation of the gall-bladder. If the gallstone is too small to produce a spasm of the duct, or if it is too large to be grasped by the wall of the duct, colic will be absent. This is true of gallstones over one-half inch in diameter. Biliary obstruction due to neoplasms, cicatricial occlusions, and flexions of the ducts never produce colic.

<sup>1</sup> Medical News, p. 825.

## CHART.

Symptoms.	Pain .....	{ Local. Referred.
	Colic.....	{ Character. Duration.
	Nausea .....	Emesis.
	Hypersensitivity.....	{ (a) Palpation. (b) Percussion. (c) Inspiration.
	Temperature .....	{ Continuous. Intermittent. Remittent. Temperature angle of cholangitic infection.
	Tumor.....	{ Shape. Position. Continuous with liver. Relation to hepatic margin. Courvoisier's law.
	Jaundice.....	{ Continuous. Remittent. Intermittent. Relation to..... { Pain law. Temperature. Tumor.
	Acute .....	{ Calculous..... { Monolithic 21 % Multilithic 79 % Obstructive Non-obstructive. { Catarrhal. Furulent. Septic. Gangrenous.  Non-calculous.... { Post-typoid pneumonia. Post-calculus. Crypt infection.
	Chronic .....	{ Calculous..... { Non-obstructive.... { Catarrhal. Suppurative. Gangrenous.  Obstructive..... { Large calculus in neck. Infection above stone. Infection below stone. Hydrops. Empyema.  Non-calculous.... { Catarrhal. Purulent. Contracted. Septic or distended.
	Cystic duct .....	{ Calculous (stone in duct)..... { Acute..... { Catarrhal impacted stone. Purulent impacted stone. Septic impacted stone. Recurrent.  Chronic..... { Impaction. Obstructive. Edema of mucosa.
Cholangitis.	Non-calculous....	{ Catarrhal. Purulent. Infective.
	Choledochotic	{ Calculous (stone in common duct)..... { In transit-traumatic. At ball valve ..... Stationary (foreign body). In diverticulum..... Post-colic..... { Without sepsis.  Traumatic ascending infection after passage of calculous.
	Infective. ....	{ Catarrhal. Purulent. Septic.
	Terminal or parenchymatous	{ With septic cholecystitis. 1. Pre-operative. 2. Post-operative. Post-colic. After calculus. After echinococcus cysts, or plugs of mucus. Idiopathic .....
		{ Catarrhal. Purulent. Grave.

The colic lasts while the calculus or other foreign body is advancing. If the foreign body stops the colic ceases and the foreign body may lie in a dilated duct for months without producing colic.

Nausea and vomiting are reflex symptoms. By their relaxing effect they favor the dropping back of the stone into the gall-bladder, and so they may terminate an attack of colic. Reflex vomiting may also be due to torsion, friction, or valvular obstruction of the cystic duct. If so, it is not accompanied by colic.

In all varieties of infection and calculus obstruction the gall-bladder is hypersensitive, as shown by deep palpation just below the right ninth intercostal cartilage. When pressure is made at this point the patient will be unable to take a deep breath, as the diaphragm forces the sensitive gall-bladder against the examining fingers, and inspiration ceases as suddenly as though the air had been shut off. This hypersensitivity is wanting in obstruction due to neoplasm, torsion, flexion, or adhesions.

The rise and fall of temperature is very sudden, giving the temperature chart a peculiar angularity different from the curves shown in the temperature charts of other types of infection.

Murphy's experience confirms the accuracy of Courvoisier's observations in regard to jaundice and contraction of the gall-bladder, namely, that in 80 per cent. of the cases of obstruction of the common duct from calculus there is contraction of the gall-bladder, while in 90 per cent. of the cases of enlargement of the gall-bladder the obstruction is due to causes other than stones. This contraction of the gall-bladder in cases of gallstone is due to an infection of the gall-bladder with infiltration of its walls and subsequent contraction, in the same manner as contraction of the urinary bladder occurs after infection. In non-infective obstructions of the common duct the gall-bladder dilates as the fluid backs up.

Murphy found jaundice absent in 86 per cent. of his operative cases. In malignant disease the jaundice is continuous. In calculus obstruction the jaundice is remittent if the duct is dilated and the calculus has a valvular action. But it is never intermittent while there is a calculus in the hepatic or common duct. It is intermittent if the calculus is situated in the gall-bladder or cystic duct, or is partly in the common duct and partly in the cystic duct, and causes inflammatory swelling which extends to the common duct. It is also intermittent between the passages of stones through the common duct.

An important law in reference to jaundice and pain may be thus stated : 1. Jaundice due to gallstones is always preceded by colic. 2. Jaundice due to malignant disease or catarrh of the ducts, accompanied by infection, is never due to colic.

As is well known, gallstones may remain in the gall-bladder without giving symptoms. Symptoms are produced (a) by disarrangement of the calculi; (b) by their impaction in the neck of the gall-bladder; and (c) by infection of the gall-bladder, with or without impaction. These symptoms have been mentioned above. The relief which follows vomiting is so marked that a diagnosis of gastralgia is made by the physician in about 90 per cent. of these cases. Patients often go through recurrent attacks of pain and vomiting for years before consenting to an operation. If infection of the gall-bladder takes place with calculi the symptoms are marked in proportion to the retention of the products of infection in the gall-bladder. If the cystic duct is occluded the temperature rarely exceeds 101°. If the infection is virulent pain is more severe, and within a few hours there is a chill, and the temperature rises to 102° or 103°. The abdominal muscles are rigid, nausea and vomiting are persistent, and the patient is profoundly depressed. The mucosa of the gall-bladder may become necrotic and rupture to form a circumscribed or general peritonitis. If impaction of a calculus occurs after a virulent infection the pain is more intense, the chill is usually severe and prolonged, and the temperature may reach 105°. The mucosa of the gall-bladder rapidly becomes gangrenous.

There is another distinct type of infection of the gall-bladder manifest by recurrent chills, high temperature, rising in an hour to 104° or 105°, remaining stationary for a few hours, dropping as suddenly to normal without pain, colic, or jaundice. This gives an angular temperature chart, as mentioned above. A diagnosis of malaria is frequently made in these cases. One physical manifestation, which is universally present, is the inability of the patient to inspire deeply when the examiner's fingers are pressed beneath the right ninth costal cartilage.

The gall-bladder may become acutely inflamed in connection with *malignant disease*. Such an attack begins with a chill and high temperature, with or without colic. There will then be a morning remission and afternoon rise of temperature, but never the intermission to normal seen in the class of cases previously mentioned.

A stone five-eighths of an inch in diameter or greater will slowly advance through the cystic duct and reach the common duct without producing colic, chills, or fever. In these patients infection exists below the stone, but does not pass above it; or, if purulent infection surrounds the stone, necrosis will follow and the calculus will escape into the stomach or duodenum. A large stone may be retained in a pouch of the cystic duct, and from time to time give rise to infectious attacks, with chills and angular temperature, but without colic or

jaundice. In these cases there is always hypersensitiveness in the right hypochondrium.

If a stone passes rapidly through the common duct the patient suffers from pain and colic in the right hypochondrium and epigastrium, and the right or, rarely, the left subscapular region, nausea and vomiting, jaundice and epigastric tenderness without fever. If the stone remains stationary for some time the common duct dilates, so that the stone may slide back and forth like a ball valve in the dilated portion. The jaundice will then be diminished, but will not disappear entirely. If the stone causes ulceration of the mucous membrane of the duct symptoms of infection will be added, and the temperature chart will show the angularity mentioned above. When a stone has once formed a diverticulum or dilatation of the duct its further progress in the canal is improbable, although it may escape by ulceration into the peritoneal cavity, the stomach, or duodenum ; if not the patient will probably die of septic cholæmia.

If the stone is arrested in the ampulla of Vater the drainage is more free and the symptoms of sepsis are less marked. There is, however, the additional danger of infective pancreatitis or fat necrosis. This may be the explanation of the sudden and extreme collapse, with intense pain, occurring in the course of calculous jaundice. If, at operation, such areas of fat necrosis are seen in the mesentery, omentum, or pancreas, the stone in the common duct should certainly be removed.

**Significance of Jaundice in Disease of the Biliary Tract.** Deaver<sup>1</sup> thus summarizes the more important conditions which cause obstructive jaundice :

First and foremost, jaundice is absent in the majority of cases of gallstone disease.

Second, the jaundice following acute gastrointestinal symptoms means a catarrhal condition of the ducts, and may be followed by suppurative cholangitis with its deep jaundice and well-marked symptoms.

Third, jaundice following chronic gastrointestinal symptoms is usually due to chronic pancreatitis with induration and enlargement of the head of the pancreas, and with or without gallstones (after excluding malignancy).

Fourth, acute obstruction of the common duct by a stone furnishes characteristic symptoms easily diagnosticated. Chronic impaction is followed by the intermittent type of jaundice without enlargement of the gall-bladder, or else by no jaundice whatever. Should the icterus become intense, the fever, sweating, and chills of suppurative cholangitis will denote infection.

<sup>1</sup> New York Medical Journal, 1903, vol. lxxviii. p. 301.

**On the Choice of Operation on the Biliary Passages.** Richardson<sup>1</sup> reserves the operation of *cholecystectomy* for cases in which the gall-bladder has in itself attributes which sooner or later threaten life. While admitting that his tendency on the whole is toward more frequent resort to cholecystectomy, it is decidedly against the application of that remedy in all cases. According to Richardson "the analogy between the gall-bladder and the appendix is not complete; the one has a definite and evident physiological purpose; the other, if it has a physiological function, has one that is neither evident nor definite. The one is a receptacle for an aseptic secretion; the other contains material which, normal or abnormal, is highly septic and infectious. The one can serve a useful physiological purpose after being operated upon; the other cannot. The one permits operations upon itself of great benefit to communicating structures; the other permits no operation upon itself except total destruction. The one is seldom in itself suddenly menacing to life; the other is frequently so."

The advantages of cholecystectomy may be thus stated :

(a) The wound heals immediately, and the liability to hernia is therefore slight; (b) there is no possibility of gallstones forming in the gall-bladder; (c) there is no possibility of a subsequent cholecystitis; (d) there is no possibility of malignant growths starting in the gall-bladder; (e) the formation of adhesions is reduced to a minimum.

Its disadvantages are as follows :

(a) There is no possibility of draining the biliary passages, except through one of the ducts, and that only after a difficult and unsatisfactory operation; (b) there is greater danger in the operation; (c) redrainage of the biliary passage is extremely difficult and dangerous.

In view of these facts Richardson draws the following conclusions :

1. Certain lesions in themselves demand removal of the gall-bladder whenever possible, such as new-growths and gangrenes.

2. Certain other lesions of the gall-bladder are better treated by cholecystectomy. These are the contracted and inflamed gall-bladders with thickened walls. All gall-bladders which do not permit easy and efficient drainage should be extirpated, for in such gall-bladders the risks of drainage are quite as great as the risks of extirpation; and the one great advantage of cholecystostomy is then impossible—retention of the biliary reservoir to fulfil the functions of that reservoir, and to permit, if necessary, renewed drainage in future years.

3. Drainage is preferable in the dilated and infected gall-bladder, which, however, is neither gangrenous nor to any great extent changed—the slightly thickened gall-bladder containing gallstones and infected

<sup>1</sup> Medical News, 1903, vol. lxxii. p. 817.

bile. This gall-bladder will, after drainage, become normal, and therefore capable of fulfilling the functions of a gall-bladder. Through it the biliary passages will become effectually drained, after subsidence of the temporary swelling about the cystic duct.

4. As a rule, drainage rather than extirpation is demanded in acute cholecystitis with severe constitutional symptoms, when the gall-bladder is dilated, or at least not contracted, and when it is not gangrenous.

5. In chronic cholecystitis, with dilatation and thickening of the gall-bladder, especially when a stone is impacted in the cystic duct, extirpation is the preferable operation unless the stone can be dislodged backward into the gall-bladder, in which case drainage is, if not preferable, quite as advantageous as extirpation.

6. In simple gallstones, without visible evidence of infection or chronic changes incompatible with complete restoration of function, simple drainage of the gall-bladder is indicated.

7. In chronic pancreatitis, whether associated with gallstones or not, drainage through the gall-bladder is indicated. Cholecystectomy is unjustifiable, for immediate drainage is essential. Furthermore, re-opening of the biliary passages may in the future be required.

**Hepatic Drainage in Affections of the Biliary Tract.** Deaver<sup>1</sup> emphasizes the importance of early operation in *gallstone diseases* as a means of preventing the evil effects of infection. His conclusions are :

1. Patients having *suppurative cholangitis* should be operated on before the infection injures the liver cells and before the retained bile has a chance to react injuriously on the general organism. The presence or absence of gallstones is of no moment in deciding for early operation, though they are usually present.

2. *Cholecystostomy* is the operation of choice when the lesion is acute and the gall-bladder has been functioning up to the time of infection.

3. Excision of the gall-bladder can safely be performed in chronic calculous cholecystitis with an obstructed cystic duct.

4. Hepatic drainage must be provided for in all cases where infection is present or suspected, either through the gall-bladder or by opening the common duct or the hepatic duct.

5. Abscess of the liver is prevented and pancreatitis relieved by prompt drainage of infected bile ducts.

**The Record of Five Hundred and Forty-seven Operations upon the Gall-bladder and Biliary Passages.** Mayo<sup>2</sup> has published the record of more than five hundred operations upon the gall-bladder and biliary passages performed at St. Mary's Hospital, Rochester, Minn.

<sup>1</sup> New York Medical Journal, 1904, vol. lxxix. p. 147.

<sup>2</sup> Boston Medical and Surgical Journal, 1903, vol. cxlviii. p. 545.

This table is printed below. The mortality for the whole series of cases is only 3.5 per cent., while the mortality in operations performed for stones in the gall-bladder without complications was less than 1 per cent. in 208 cases. While it is admitted that from 5 to 10 per cent. of adults have gallstones, the diagnosis is far less often made, and doubtless indefinite pains are frequently attributed to indigestion which are due to the presence of gallstones and the pathological processes for which they are responsible. A typical attack of colic is likely to be accurately diagnosed.

While under normal conditions the bile contains few if any bacteria, a gall-bladder containing stones is always infected. In nineteen cases Mayo removed unsuspected gallstones during an operation performed for another purpose. Subsequent inquiry of these patients demonstrated that the majority of them had suffered at times from the presence of the gallstones, although a correct diagnosis had never been made.

In some of these cases there was either marked contraction of the gall-bladder or dense adhesions around it.

In uncomplicated cases the operation is simple. The gall-bladder is opened, the stones are removed, the fundus of the gall-bladder is attached to the abdominal wall, and the organ is temporarily drained. This not only cures the condition, but the permanent elevation of the fundus of the gall-bladder insures better drainage in future. The gall-bladder should never be closed by suture in active gallstone disease, since under these circumstances infection is always present. If a gallstone becomes impacted in the cystic duct, or in the pelvis of the gall-bladder, inflammatory thickening of the wall of the gall-bladder is more marked. As a rule, in these cases the stone can be discharged and extracted and the gall-bladder drained, as described above. Occasionally the wall of the duct must be incised for the extraction of the stone. The duct is then sutured and the gall-bladder drained or removed. Operation in 183 cases of stones impacted in the pelvis of the gall-bladder or in the cystic duct resulted in six deaths, a mortality of 3½ per cent.

If the walls of the gall-bladder have undergone marked changes, or there is stricture of the cystic duct, so that a mucous fistula seems likely to follow a simple drainage, the gall-bladder should be removed. If there is cholangitis it is not wise to ligate the cystic duct, since it may be needed for drainage of the bile to the surface. In this class of cases a good operation is the removal of the fundus and entire mucous membrane of the gall-bladder, so that the peritoneum and outer layers of its base may be retained to form a pouch into which the end of the drainage-tube can be fastened. Mayo reports seventy-five cholecystectomies, with two deaths.

Kehr, Robson, and others of large experience in gallstone surgery

found no gallstones reformed after operation. This has also been Mayo's experience, although in his early operations stones were sometimes discharged from the wound during convalescence, but these had plainly been overlooked during operation. The following is a table of 547 operations upon the gall-bladder and bile passages (more than one operation performed at one time, only the major is tabulated) occurring at St. Mary's Hospital, Rochester, Minn., from June 24, 1891, to May 13, 1903:

## OPERATIONS FOR BENIGN DISEASE.

	Total.	Recovered.	Died.
Cholecystostomy: stones in gall-bladder, cystic duct, or both	299	296	3
" polypus in gall-bladder . . . . .	1	1	
" gall-bladder stone with acute pancreatitis and fat necrosis . . . . .	1	1	
" cholecystitis with and without stones . . . . .	51	46	5
" stones in common duct . . . . .	59	56	3
" gallstone disease . . . . .	56	55	1
" cholecystitis . . . . .	9	8	1
" cyst of gall-bladder containing ten quarts, supposed to be ovarian . . . . .	1	1	
Cholecystenterostomy: chronic pancreatitis and jaundice, 4 with gallstones, 1 without . . . . .	5	5	
Perforation of calculus, abscess, and general peritonitis . . . . .	2	...	2
Division of adhesions . . . . .	16	16	
Duodencholedochotomy: stone ampulla of Vater . . . . .	1	1	
Exploratory: negative . . . . .	21	21	
Total benign . . . . .	522	507	15

## OPERATIONS FOR MALIGNANT DISEASE.

	Total.	Recovered.	Died.
Chelecystectomy . . . . .	4	3	1
Cholecystostomy: obstruction common duct . . . . .	5	3	2
Chelecystectomy and partial hepatectomy: cancer of the gall-bladder . . . . .	1	1	
Duodencholedochotomy: cancer ampulla of Vater . . . . .	1	1	
Chelecystenterostomy: malignant obstruction of common duct . . . . .	4	3	1
Exploratory: inoperable cancer . . . . .	10		
Total malignant . . . . .	25	11	4
May 13, 1903 (benign and malignant)	547	518	19

St. Mary's Hospital reports, 527; Minnesota State Hospital and private practice, 20

**The Mortality of Operations on the Gall-bladder.** Seymour<sup>1</sup> reports 44 operations upon the gall-bladder and ducts, with 6 deaths, or a mortality of about 13.5 per cent. There was only 1 death as the result of 34 uncomplicated cholecystostomies; 2 complicated cholecystostomies were performed, both of them proving fatal. In 8 cases there were stones in the common duct, and in 5 of the 8 cases stones were also found in the gall-bladder; 2 of these patients died.

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xl. p. 1052.

Two cholecystectomies were reported, one of them being fatal.

**Rupture of the Gall-bladder from Vomiting.** Grant<sup>1</sup> describes an attack of severe abdominal pain in the region of the gall-bladder occurring in a patient aged fifty-three years, with a history of two previous attacks of colic. The patient was given a hypodermic injection of morphine, but two hours later the pain increased, vomiting was added, and there was marked rigidity of the abdominal muscles. In twelve hours the temperature had gone up to 103.5°, and operation was performed.

The appendix was first exposed. It was cystic and bile flowed freely from the wound as soon as the peritoneum was opened. The gall-bladder was completely collapsed and could not be brought into the wound. No stone could be felt in the ducts. Owing to the condition of the patient's heart the operation could not be prolonged. The patient died in four days of septic peritonitis. No autopsy was permitted, so that the exact site of rupture is not known.

**Improved Technique of Cholecystenterostomy.** Maragliano<sup>2</sup> advocates an enteroanastomosis between the afferent and efferent portions of the loop of intestine chosen for anastomosis with the gall-bladder. This improvement in technique will cause most of the fecal stream to pass by the enteroanastomotic channel, and will reduce to a minimum the chance of infection of the biliary passages and the stasis of bile. The additional time required for the operation is not great.

**Retroduodenal Choledochotomy.** Berg<sup>3</sup> has exposed the common duct in the cadaver through an incision in the right rectus muscle. The liver is drawn upward, the colon downward, and the stomach to the left. Next the posterior parietal peritoneum is incised longitudinally just to the right of the descending portion of the duodenum. Then with the finger the descending portion of the duodenum is liberated and turned to the left. This brings its posterior surface and the retroduodenal and papillary portions of the common duct to the front, and affords an excellent exposure. The duodenal branch of the pancreatic duodenal artery lies anterior to the duct about one-fourth of an inch. The accompanying vein lies just behind the duct, and sometimes a branch of the vein crosses it. The superior mesenteric branch of the portal vein lies to the inner side of the duct, and the vena cava posterior to it. The duct is readily recognized and can be grasped between the fingers, incised, and impacted calculi removed. A temporary gauze drain should lead to the incision in the duct, or if

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xl. p. 1057.

<sup>2</sup> Centralblatt f. Chirurgie, 1903, p. 941.

<sup>3</sup> Annals of Surgery, 1903, vol. xxxviii. p. 275.

longer drainage is required the common duct may be incised in the gastrohepatic ligament.

**The Late Results of Operations for Gallstones.** Schott<sup>1</sup> has reported the permanent effects of operations for gallstones upon 180 patients in Czerny's clinic. In 8 per cent. of patients gallstones were subsequently discharged through the fistula ; and in 3 per cent. subsequent stones were otherwise discovered. Only 1 per cent. of the patients suffered from the recurrence of colic, but no less than 10 per cent. of the conservative operations and 15 per cent. of the operations with drainage were followed by jaundice. Biliary fistula occurred in less than 5 per cent. of the cases, a proportion only half as great as was observed in previous years. Czerny ascribes this better result to his present practice of fastening the gall-bladder to the parietal peritoneum and inserting a drainage-tube to which the edges of the wound cling so closely that the mucosa of the gall-bladder does not project into the abdominal wound, interfering with its healing. Gastrointestinal disturbances were noted in 36.6 per cent., probably due to formation of adhesions. In the total 180 cases of patients kept under observation for from five to six years there was permanent cure of the tendency to biliary lithiasis in 95 per cent. Genuine recurrence of stones was not observed in a single case, and in only 5 per cent. did symptoms develop which could possibly be attributed to the biliary system. The mortality of gall-stone operations has been reduced to 5 per cent., and that of cystostomy to 1.3 per cent. Cystectomy shows only 20 per cent. mortality and choledochotomy only 4.4 per cent. in comparison to the 12 per cent. of former series of operations. These percentages justify early operations in case of gallstones.

Mayo<sup>2</sup> says that a few patients upon whom *cholecystotomy* has been performed suffer from slight colic and sometimes transient jaundice during the first month or two after discharge from the hospital. These symptoms are due to the inability of an adherent gall-bladder to properly empty itself. In most cases no second operation is required. The most common of later symptoms is the incomplete removal of the stone. There is little excuse for leaving gallstones in the bladder, as even a small one can be readily palpated before the abdomen is closed. Stones in the cystic duct are more likely to escape notice, unless the high abdominal incision is employed and a sand-bag is placed under the patient's back.

In septic cases drainage is necessary for a long period of time, especially if the infection is due to the colon bacillus. Under such

<sup>1</sup> Beiträge zur klin. Chirurgie, 1903, Band xxxix, p. 407.

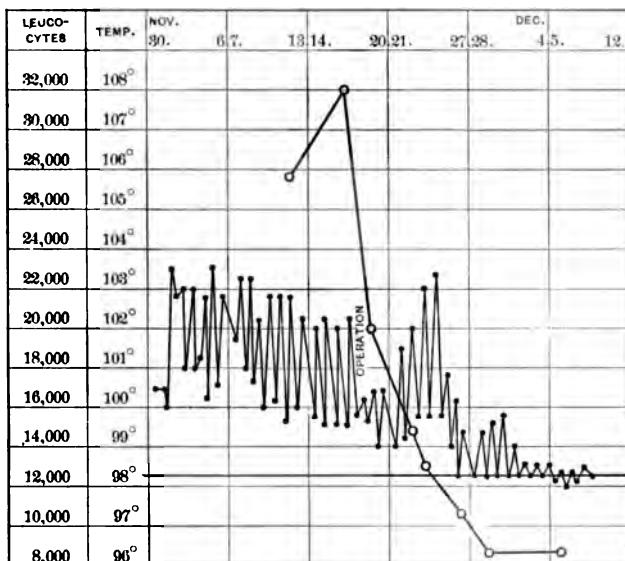
<sup>2</sup> Journal of the American Medical Association, 1903, vol. xli. p. 1569.

circumstances a tube should be kept in until the bile becomes sterile. If the wound is allowed to heal too quickly severe symptoms may result. If chronic pancreatitis exists as a complication prolonged drainage is also necessary.

Stones may be overlooked in the common duct if they do not obstruct the duct and other stones are found in the gall-bladder and cystic duct. Therefore one should make it an invariable rule to explore the ducts with the finger in every case before opening the gall-bladder.

In Mayo's experience secondary operations have been comparatively safe. The patient has become accustomed to the condition, and the adhesions form a protective barrier. Separation of the adhesions, par-

FIG. 35.

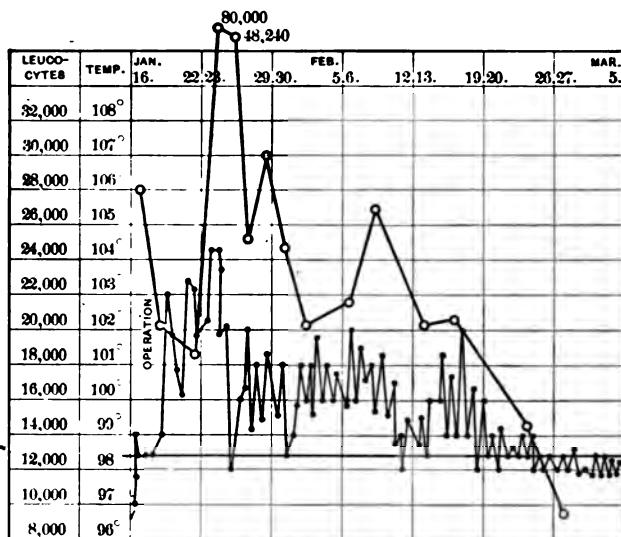


CASE I.

ticularly about the liver, results in considerable hemorrhage. Rather prolonged gauze pressure usually checks the oozing as the blood pressure in the liver is very low, and enables completion of the operation. Most of these cases require a light gauze drain protected by gutta-percha tissue at points of contact with the stomach or intestine, to prevent troublesome adhesions to the gauze. Deep drains should be anchored with catgut to prevent displacement by movements of the liver as affected by the diaphragm. The catgut becomes absorbed before the time for withdrawal. The drains should not be removed too early, six to twelve days being the usual limits as to the time of withdrawal.

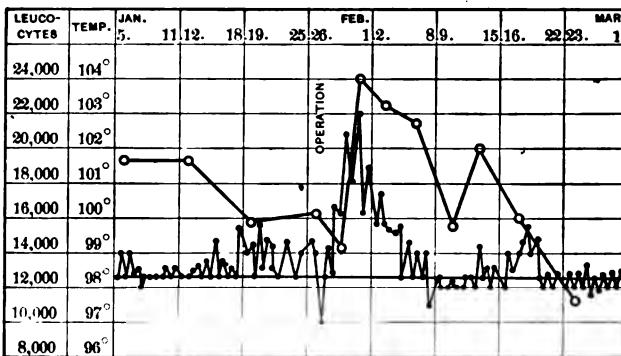
**Abscess of the Liver.** VALUE OF LEUKOCYTE COUNTS. Schlayer<sup>1</sup> finds hyperleukocytosis a valuable diagnostic sign of abscess in the liver. In eleven cases of acute or subacute abscess following dysentery the leukocytes ranged from 18,000 to 62,000 (average 25,000) on the

FIG. 36.



CASE II.

FIG. 37.



CASE III.

day before operation. There was an exception in only one of these eleven cases. In obscure cases of typhoid or malaria he has found the absence of hyperleukocytosis a valuable sign for the exclusion of liver abscess.

<sup>1</sup> Münchener med. Wochenschrift, 1903, vol. 1. p. 1372.

Bassett-Smith<sup>1</sup> reports five cases of abscess of the liver which illustrate the importance in diagnosis to be gained by a leukocyte count, especially in the early stages of the disease. (Fig. 35.)

The line of the leukocyte curve in Case I. shows a rapid rise before operation and a rapid and steady fall afterward, the patient making a perfect recovery. In Cases II. and III. there was an immediate fall after the operation and a rise, with subsequent increase, of temperature, which in Case II. was due to pneumonia of the right lung. These patients ultimately recovered. (Figs. 36 and 37.)

**TREATMENT.** Bassett-Smith is a believer in the value of a free examination of the liver by a well-devised open operation, a method

FIG. 38.

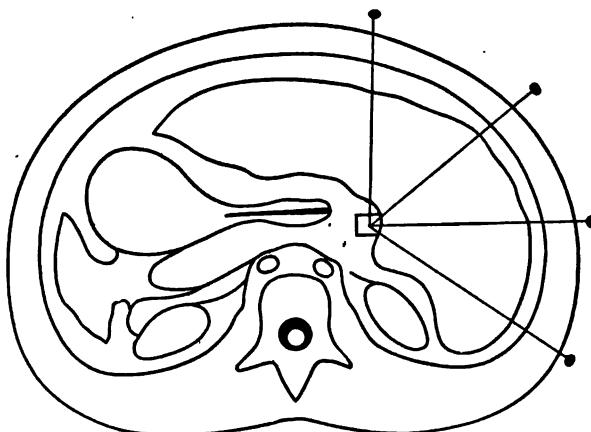


Diagram showing the inferior vena cava to be (practically) equidistant from the surface of the body at the level of the liver, anywhere in a line drawn from the xiphoid cartilage along a line around the right side of the body as far as the angle of the ribs. (CANTLIE.)

of treatment which, he says, is steadily gaining ground. In two of his five cases exploratory puncture failed to reveal the situation of the abscess, which burst upward into the right lung in both cases. Neither of these patients had entirely regained his health some months later.

Hatch, who has had an enormous experience at Bombay with abscess of the liver, recommends free incision between the ribs without resection of bone and without washing out the abscess cavity. He does not stitch the pleural surfaces, nor has he ever seen bad results follow the escape of pus into the abdominal cavity.

Rogers, a Calcutta surgeon, found pyogenic organisms in the pus in only eight out of twenty-four cases. The comparative sterility of the

<sup>1</sup> British Medical Journal, 1903, vol. ii. p. 654.

pus may explain the infrequent occurrence of secondary peritonitis. He demonstrated amoebæ in the walls of sixteen out of seventeen abscesses.

Cantlie<sup>1</sup> believes thoroughly in the use of the cannula and siphon drainage as a means of diagnosis and treatment of abscess of the liver. Many surgeons have a fear of puncturing the vena cava in searching for abscess of the liver with a trocar and cannula; using therefor a needle which is too short, they may fail to reach the abscess. Fig. 38 shows the vena cava to be almost equally distant from the surface at any point at which an aspirating needle would be employed.

As many of these abscesses have to be operated upon in the tropics under circumstances in which skilled assistants are not available, the advocates of the trocar and cannula might seem to have the better of the argument. But Cantlie prefers treatment by cannula for deep-seated abscesses no matter what his hospital facilities may be, as the following paragraph clearly shows:

"In the best circumstances, however, I maintain that a *deep-seated* suprahepatic or intrahepatic abscess is best treated by the trocar and cannula and siphon drainage through a large tube. Subhepatic abscesses, of which I have had experience of three, should always be operated upon by abdominal incision. If, also, the practitioner waits or does not see the case until the pus is pointing to the epigastrium or toward the right ribs laterally, an incision, with removal of a portion of a rib if necessary, is no doubt the better treatment; but with deep-seated abscess it is a different matter. The exposure of a liver with pus deep-seated in its substance does not help one in locating the presence of pus in the organ; one is no wiser clinically by such a procedure, and Colonel MacLeod relates a case of a well-known surgeon (in Britain) exposing the liver by abdominal incision and finding the organ apparently healthy, closing the wound, to be told that two days afterward his patient passed a large quantity of liver pus by the bowel. I have no hesitation in saying from the result of a considerable experience now, that for the treatment of deep-seated liver abscess (and they are all deep-seated in the early stage, when they should be operated upon) the trocar and cannula method, with ample siphon drainage, is the proper method of treatment, be the operator ever so skilled and his hospital environment of the very best."

Rhoade<sup>2</sup> has abandoned aspiration as a means of diagnosis of abscess of the liver, because he has found it so uncertain. The surgeon who depends upon aspiration is apt to procrastinate in his treatment if the

<sup>1</sup> British Medical Journal, 1903, vol. ii. p. 676.

<sup>2</sup> American Medicine, 1903, vol. vi. p. 659.

needle does not draw pus. Rhoads performs direct palpation as a sure means of diagnosis and a guide to subsequent treatment. On first thought it will appear to be rather a formidable preliminary course to pursue with such patients, some of whom are bed-ridden from a long occurrence of dysentery, and in whom the spark of vitality is necessarily low ; but it is remarkable how much the patients, inured to toxic infection for a limited time, can stand, and how quickly they recuperate once the principal cause of their asthenia is removed ; and the information gained is so important and the carrying out of further surgical interference is so much simplified that the initial depression of the exploratory incision is more than counterbalanced by the chance afforded for a quick return to health.

For several days previous to the day set for operation solid food is withheld and a proper hygiene is instituted, including the use of a saline and a nerve stimulant. An approximate diagnosis is made by external palpation if possible. The patient is then prepared for abdominal section in the right hypochondriac and epigastric regions. A curved incision below the costal margin with its centre over the gall-bladder is best in most cases. It should be long enough to permit the hand to pass easily into the abdominal cavity.

A methodic digital examination of the liver is made, starting at one of its boundaries and sweeping the hand over the entire surface of the organ, searching for any irregularities of surface, adhesions, and the peculiar resistant tense bogginess which is an unmistakable sign of gland suppuration. Previous assistance at operations or palpation of fresh pathological specimens will educate the touch of the surgeon so that he can easily recognize deep-seated pus. The search is not abandoned when one abscess is found, but the whole liver is carefully gone over, as multiple abscesses are not uncommon.

When the abscess is found it must be drained, either through the abdominal incision or the chest wall. In the former case the point of incision into the liver is completely walled off by gauze from the rest of the peritoneal cavity. In opening the abscess a scalpel is preferable to the clumsy thermocautery. Hemorrhage always stops as soon as the escape of pus relieves the congestion. When the capsule of the liver has been cut through a clamp is pushed into the abscess cavity, opened widely and withdrawn. The finger is passed into the abscess cavity to explore its recesses and break down trabeculae, and the cavity is then wiped and drained with gauze and a large rubber tube.

If the abscess is near the upper or posterior surfaces of the liver it must be drained through the chest wall. For this purpose 8 cm. (3.2 inches) of the eighth or ninth rib back of the post-axillary line are resected, and the pleura dissected from the ribs and diaphragm

without being opened. The diaphragm is next cut through, the site of incision in the liver walled off, and the abscess opened and drained in the manner described above. If there are adhesions between the layers of pleura or between the liver and diaphragm these precautions are unnecessary.

The after-treatment is important, as the abscess of the liver is merely a complication of the dysentery. All drugs should be abandoned, and the patient given on an empty stomach 30 c.c. to 90 c.c. (one to three ounces) of pure olive oil with a little lemon juice thrice daily. During the past year 800 patients with dysentery were treated at the United States General Hospital, Presidio, Cal., with excellent results. The stools become normal in about two weeks, and the patients gain from forty to fifty pounds after about six weeks' treatment. Rhoads begins the administration of oil on the tenth day after operation. He reports operation for hepatic abscess upon 16 patients, 11 of whom recovered, while 5 died.

Mendes has evacuated a large abscess of the liver by a parapleural transdiaphragmatic operation. In operating by this incision he avoids infection of the pleural and peritoneal cavities. He starts his incision over the seventh interspace and turns back a flap of soft parts containing a portion of the eighth and ninth ribs. The pleura is detached and put out of the way, and the exposed diaphragm is incised and the abscess opened and drained. In the case reported the drains were expelled by the ninth day, and the wounds were completely healed within a month.

**Abscess in the Biliary Passages.** Abscesses in the liver may form within the bile ducts, secondary to suppurative cholangitis. This condition is invariably fatal unless it is treated surgically. Its diagnosis is by no means easy. The cause in eighteen out of twenty cases recorded by various observers was the presence of gallstones in the hepatic or common duct, suppuration in the other two cases being due to hydatid cysts which opened into the hepatic duct, and to primary cancer of the common duct. Many of the cases terminated fatally soon after definite symptoms of suppuration showed themselves. One patient, however, lived eighteen months after an operation for supposed empyema, the pus being stained with bile. At the autopsy the bile ducts were found to be greatly dilated with pus above some gallstones. There was a direct communication between the dilated hepatic ducts and an abscess at the base of the right lung, and a second abscess in the region of the kidney. In another case drainage was established by communication between the dilated bile ducts and an impacted colon. This patient lived six months. If such imperfect drainage will prolong life for many months, perfect drainage ought

to effect a cure. Owing to very great dilatation the ducts can be found and drained without difficulty. Indeed, in one instance the dilated hepatic duct was mistaken for the gall-bladder and brought to the surface and drained.

Diagnosis in an early stage of the trouble is difficult, but there is one group of symptoms to which Rogers<sup>1</sup> attaches great significance.

"It consists of a complete obstructive jaundice, which is always present in the earlier stages of the disease, followed by the reappearance of bile in the stools in often small quantities and a decrease in the jaundice, accompanied by an aggravation of the general symptoms, with rigors and hectic condition, instead of the amelioration naturally expected to ensue on the partial removal of the complete obstruction of the bile ducts. This improvement in the jaundice and reappearance of bile in the intestine, together with increasingly severe general symptoms, is due to softening and distention of the wall of the ducts by suppuration occurring within them above the obstruction, leading to loosening of the impacted stone, which in turn allows of the escape of a little of the bile and pus into the bowel past the stone. This sequence of symptoms is an indication for immediate operation to drain the ducts."

Rogers promptly made a correct diagnosis of biliary abscess, and operated upon the patient shortly after his admission to the hospital. Unfortunately the patient was unable to recover from the shock of the operation. The description of the operation and the conditions found at autopsy are instructive.

**OPERATION.** An incision was made in the right linea semilunaris, with its centre over the lower edge of the liver. The gall-bladder was completely hidden beneath the edge of the liver, but its fundus was reached and opened, and a number of small gallstones were extracted. On now passing the finger along the bile ducts beneath the liver a large mass of gallstones were felt deep under the liver, which could only just be reached. The wound was now enlarged upward and downward, and a transverse incision made across to the middle line, so as to enable the lower edge of the greatly enlarged liver to be turned up. The mass of stones in the right hepatic ducts could now be reached and opened, and with very considerable difficulty a mass of large gallstones, some three inches in length and over an inch in diameter in places, were removed, some of which were well within the liver substance. As it was quite impossible at such a depth to bring the opening in the duct to the surface, and as the patient was in a low state, a glass drainage-tube was inserted and gauze carefully

<sup>1</sup> British Medical Journal, 1903, vol. ii. p. 706.

packed around it and the wound united around the tube. The patient suffered severely from shock, but rallied somewhat in the afternoon, but was much troubled by coughing up mucus. At 10 o'clock in the evening he was easier and coughing up mucus more easily. However, he never fully rallied from the shock of the prolonged operation, and died at 5.30 A.M.

**NECROPSY.** The same morning the body was examined. There were already good adhesions around the gauze packing and no trace of leakage of discharge into the peritoneal cavity. The liver was removed with the stomach and duodenum and right lung, all together. Only one small gallstone in the depth of the liver in the right hepatic duct was found, which was much smaller than some of those removed at the operation, so would easily have escaped through the opening made in the duct, and would doubtless have escaped through the wound, although too deep in the liver to be removed at the operation.

Behind this stone the bile ducts were much dilated and full of pus in a limited portion of the upper posterior portion of the right lobe of the liver. This tracking abscess had opened posteriorly by the side of the inferior vena cava, and travelled up through the diaphragm and the base of the right lung into the inferior bronchi. The common bile duct was dilated, and its opening into the duodenum was large and free.

**Congenital Cyst of Biliary Passages.** Miller<sup>1</sup> mentions the occurrence of a cyst in the abdomen of a child aged two and a half years, which he believes was due to obstruction of the common duct and subsequent dilatation of the gall-bladder and bile ducts. This obstruction may have been catarrhal or due to a calculus. It probably existed early in intrauterine life, since the development of the liver was much interfered with. He drained the cyst, hoping that its dilated walls would contract sufficiently to allow the bile to pass by the natural channels. If the fistula continues to discharge bile he intends to perform cholecystenterostomy.

**Echinococcus Cysts of the Liver.** ECHINOCOCCUS CYSTS CURED BY INJECTIONS OF MERCURIC BICHLORIDE. Pirrone<sup>2</sup> says that he has in three cases quickly and safely cured patients of an echinococcus cyst of the liver by aspirating a portion of the contained fluid and injecting about 2 c.cm. (30 minims) of a 1 per cent. solution of corrosive sublimate through a needle. The procedure was repeated in a week. Exploratory puncture and aspirations were performed one month later, and the presence of leukocytes and loose hooklets in the aspirated fluid

<sup>1</sup> American Journal of Obstetrics, 1903, vol. xlviii. p. 182.

<sup>2</sup> Riforma medica, vol. xix., No. 20.

showed the death of the parasite. Before the puncture is made a constricting band is placed around the abdomen below the liver. The patient is then kept immovable on his back for twenty-four hours, with an ice-bag over the liver. No food is given by mouth for at least eighteen hours. Only a small amount of fluid is withdrawn, not more than 10 c.cm (2.5 drachms), so as not to disturb the pressure in the cyst. The injection causes pain in the right shoulder, but very little febrile reaction, not more than one or two degrees.

This simple and safe treatment has been successfully employed in a number of cases by others than this writer. It is only applicable, he says, to those cases in which there exists a single cyst with sterile contents, and which has not existed so long that the walls are very rigid. He does not advise it if the cyst is very large. In most cases of echinococcus the liver is hypertrophied, and this hypertrophy continues after the death of the parasite.

### THE SPLEEN.

**Abscess of Spleen.** Spear<sup>1</sup> reports a case of abscess of the spleen which he drained with success. The patient was up and about, and then died suddenly five weeks after operation, with aphasia and hemiplegia of the right side. A search through the literature revealed reports of sixty-five cases, one-third of which occurred after malaria or typhoid fever, while eight others were probably of malarial origin. The diagnosis is a difficult one. The chief symptoms are a history of infectious disease, pain in the left hypochondrium, which may radiate to the left shoulder, night-sweats, anaemia, loss of appetite, and usually chills. Fever may or may not be present. There may be constipation or diarrhoea. There is leukocytosis. There is tenderness on deep pressure. If left to itself the abscess may rupture into a hollow viscus or externally, but unfortunately rupture into the peritoneal cavity is more common. If an early diagnosis can be made the spleen should be removed without opening the abscess. If the spleen has already adhered its removal may be impossible. The spleen should then be fixed in the abdominal wound and the abscess drained. The use of an aspirating needle as a means of diagnosis before the abdomen is opened is dangerous and should be condemned.

Cipollina<sup>2</sup> mentions as a valuable diagnostic point of splenic abscess that patients often assume a characteristic attitude, lying on the back with the left thigh flexed. There are pyemia and local pain. If a

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xli. p. 304.

<sup>2</sup> Riforma medica, vol. xix., No. 19.

fluctuating tumor can be made out under the costal arch the diagnosis is assured. The disease is almost certainly fatal unless promptly relieved by surgical measures.

**Splenectomy for Banti's Disease.** Levison<sup>1</sup> mentions a successful operation for Banti's disease, or "splenic anaemia," which was followed by thrombosis of the right internal jugular, subclavian, and innominate veins. Banti described three stages of the disease which bears his name. In the first stage anaemia and splenic enlargement are present, the anaemia being secondary to the enlargement of the spleen. The duration of this period varies between three and ten years, and is followed by a second stage, marked by a diminution of urine and an increase in bile pigments and urates. This stage continues for several months, and then follows the third and most characteristic stage, distinguished by the development of ascites, which appears insidiously, and is accompanied by no pain. The anaemia increases, and there may be an evening rise of temperature. Death occurs within a year thereafter.

Levison's patient was under observation for ten years, and numerous examinations of the blood gave results quite in accord with Senator's description. There was first oligocytæmia, the average red blood count being 3,500,000. Second, there was oligochromia. The low percentage of haemoglobin is fairly constant, and is marked by a low color index, whereas in pernicious anaemia the reverse is true. The third characteristic of the blood mentioned by Senator is leukopenia. In nine of thirteen cases mentioned by Osler the leukocyte count was less than 5000.

In Levison's case there was first an infectious appendicitis. Then followed a period of several years' duration of perfect health, except for several profuse bleedings. Then fever, leukocytosis, diarrhoea, and slate-colored stools indicated an infectious digestive disturbance. Later the changes in the blood mentioned above developed, with ascites and severe pains between the shoulder blades, to control which enormous doses of morphine were necessary. The ascites disappeared spontaneously when the abdominal and chest veins dilated.

Removal of the spleen was followed by a rapid increase in the percentage of haemoglobin and the appearance in the blood of normoblasts and megaloblasts and the speedy restoration of the normal conditions of the blood. During convalescence thrombosis appeared in the right innominate, subclavian, and internal jugular veins, but the patient recovered from this complication. The case is one more added to the already considerable number of cures for this Banti's disease brought

<sup>1</sup> Annals of Surgery, 1903, vol. xxxviii. p. 671.

about by the removal of the spleen before the strength of the patient has been too far wasted.

**Successful Splenectomy.** Webster<sup>1</sup> mentions the removal of an enlarged spleen which was adherent to omentum, intestine, iliac fossa, bladder, right appendages, and uterus. The vermiform appendix was enlarged and buried in adhesions on the posterior surface of the spleen. The pedicle of the spleen was twisted two or three times, and its vein was enormously enlarged, especially near the spleen, where its diameter was about one inch. A large portion of the omentum was removed and the adhesions were separated with some difficulty. The vessels in the pedicle were ligated and the spleen was removed. This patient, a woman, noticed a swelling in the right iliac region seventeen years before operation, which at that time was about as large as her hand. Thirteen years after this swelling was first noticed the abdomen was opened by a median incision, and the operator, mistaking the spleen for a tumor of the right kidney, closed the abdomen. This was a case of wandering spleen, with attacks of pain due to twisting of its pedicle. The spleen was somewhat enlarged, measuring  $7 \times 4 \times 3\frac{1}{2}$  inches. It was congested and contained a good deal of fibrous tissue.

### THE PANCREAS.

**Practical Points Connected with the Anatomy of the Pancreas.** Opie<sup>2</sup> emphasizes some points of importance in connection with the anatomy of the pancreas. The islands of Langerhans consist of columns of cells in intimate relation to a rich vascular supply, and, having no communication with the pancreatic ducts, resemble in structure certain ductless glands—the parathyroid bodies and the adrenal glands, and somewhat less closely the thyroid gland. Common to all vertebrate species, they have some important function. Independent of the secreting elements of the gland, they are both concerned in the elaboration of the pancreatic ferments. The relation of their cells to a rich vascular supply suggests that their action is through the medium of the blood. Abundant evidence in accord with these facts has shown that the islands of Langerhans exert that influence upon carbohydrate metabolism which was formerly attributed to the pancreas as a whole.

Two anatomical peculiarities of the pancreas have not as yet received the attention they deserve from the physiologist and the clinician. In the first place, the organ consists of two functionally diverse elements : on the one hand, cells which supply to the intestine important diges-

<sup>1</sup> Journal of the American Medical Association, 1903, vol. xi. p. 887.

<sup>2</sup> Transactions of the Congress of American Physicians and Surgeons, 1903, p. 1.

tive ferments, and on the other hand, cells having no communication with the ducts of the gland, but in intimate relation to the bloodvessels. In the second place, the close anatomical relation of the pancreatic duct to the common bile duct favors the transmission of morbid processes from the liver and bile passages to the pancreas.

**Pathology of Pancreatitis.** Flexner,<sup>1</sup> in discussing the pathology of *pancreatitis*, *diabetes*, and *fat necrosis*, suggests that the entrance of bile into the pancreatic duct is a sufficient cause in many cases of hemorrhagic pancreatitis. The close agreement of the lesions observed in the human being with those of experimental bile injections into the pancreas in dogs lends further support to this manner of production of the disease in man.

Some observers believe that the necrosis of the tissue which follows hemorrhage is the direct result of the injury done by the extravasated blood, but later observations show that hemorrhage and necrosis are both the result of simultaneous action of some injurious agent upon bloodvessels and upon tissues.

In *gangrenous pancreatitis* the primary lesions are inflammation with necrosis and hemorrhage, and the putrefactive changes are secondary and incidental, and arise from invasion of the dead and injured tissues by putrefactive micro-organisms from the intestinal canal.

Two varieties of *suppurative pancreatitis* are distinguished, primary and secondary. The former variety originates in the pancreas, the latter proceeds from a neighboring organ or arises through metastasis. In both varieties the abscesses may be single or multiple.

The relation which the pancreas bears to the lumen of the intestine and to the hollow abdominal viscera exposes it to bacterial invasion through its ducts or directly from ruptures and perforations of these organs, while pyogenic bacteria may be brought to the pancreas by the general blood current, or ascend into it from thrombotic infections of the portal system of veins. Previous injury, especially such injury as leads to necrosis of the pancreas, predisposes the organ to suppuration. While the abscesses usually involve a fraction only of the pancreatic tissue, yet the whole gland may undergo degeneration and come to lie as a sequestrum in a pus cavity.

With reference to diabetes, Flexner shows that extirpation of the pancreas in dogs and partial resection in man have frequently been followed by diabetes. Furthermore, diabetes is often due to disease of the pancreas, especially calculus.

Opie believes that diabetes is not produced unless the islands of Langerhans are involved in the inflammation.

<sup>1</sup> Loc. cit.

The fat necrosis of the omentum and other tissues which is associated with disease of the pancreas is proved by experiment and clinical observations to be due to the escape of pancreatic juice into the peri-pancreatic and parapancreatic adipose tissue.

**Symptoms of Pancreas Disease.** Fitz<sup>1</sup> describes the symptoms of acute pancreatitis as essentially those of a peritonitis beginning in the epigastrium and occurring suddenly, during ordinary health, without obvious cause. The diagnosis, therefore, is based on pain, tenderness and tympany limited to the region of the pancreas and on the gradual development of a deep-seated peritonitis in the same place.

The differential diagnosis lies, practically, between an irritant poison, perforation of the digestive or biliary tracts, and acute intestinal obstruction. An irritant poison is excluded by the history of the case and by the examination of the vomit. Perforating ulcer of the stomach or duodenum is to be excluded by the absence of pain after eating, hemorrhages from the digestive canal, and cachexia. Acute perforation of the transverse colon is rare, and the resulting peritonitis progresses more rapidly and is likely to be general. Perforation from gallstones is usually preceded by attacks of biliary colic and jaundice, while the seat of the pain is rather in the region of the gall-bladder than in that of the pancreas. Acute intestinal obstruction is most likely to give rise to doubt. It is to be eliminated by determining the patency and capacity of the large intestine, by the rarity in the epigastrium of an obstructed small intestine, by the immediate presence of localized tenderness, and by the usual absence of conspicuous, general tympany or limited distention of intestinal coils.

In all of these conditions, excepting acute poisoning, an early exploratory laparotomy is the best method of relieving the patient.

The diagnosis of chronic pancreatic affections is based usually on the occurrence of localized pain and upon the presence of a tumor. The pain may exist without the tumor, but the latter is rarely present without the former at some time during its formation. The pain of chronic pancreatic affections is often a deep-seated discomfort; when severe it is likely to be paroxysmal, and then is suggestive of biliary colic, but is referred rather to the region of the pancreas than to that of the biliary tract. The tumor is of slow or rapid growth, large or small, perhaps distinctly palpable only in narcosis, fixed or slightly movable, with or without symptoms of pressure upon the surrounding parts. Its position behind the stomach and above or behind the colon is made apparent by inflation and percussion of these portions of the alimentary canal. Evidences of disturbance of pancreatic function are

<sup>1</sup> Loc. cit.

to be sought along the lines previously mentioned ; but experience has shown that definite additions to our knowledge must be made before functional disturbances of the pancreas can be ascertained sufficiently early and with sufficient certainty to render assured the pancreatic source of the disease. The discovery of sugar in the urine should lead to the examination of the feces for fat. The presence of the latter should suggest the search for undigested muscle fibres and for glycosuria, and alimentary and therapeutic tests should be applied to all suspected cases.

The association of jaundice with tumor has led to the diagnosis of chronic pancreatitis and to its effective treatment. Rapid formation of a tumor in connection with symptoms suggestive of gallstones may differentiate chronic pancreatitis from malignant neoplasms. The discovery of characteristic calculi in the feces has sometimes pointed to a correct diagnosis of pancreatic disease.

**Operative Treatment.** Mikulicz<sup>1</sup> mentions two methods by which the pancreas can be exposed. First the transperitoneal, and second the retroperitoneal. In the transperitoneal method the abdominal incision may be median or lateral. The pancreas is reached through the gastrocolic ligament or the gastrohepatic ligament, or after pushing up the omentum and transverse colon through the mesocolon. The head of the pancreas can also be exposed by dividing the peritoneum alongside of the duodenum.

In the retroperitoneal method the head or tail of the pancreas is exposed by lumbar incision. This method is chiefly of service when the pancreas is enlarged or displaced. In operating by the transperitoneal method one should be especially careful not to wound the middle colic arteries, as this injury will produce gangrene of the transverse colon.

In attempting to make a diagnosis of chronic pancreatic disease the surgeon must not rely upon disturbances of function, since, as a rule, they do not appear until the greater portion of the gland is affected.

Operation upon the pancreas is more dangerous than operation upon other abdominal organs, not only because of its situation, but because hemorrhage is controlled with difficulty. In spite of deep sutures, blood and pancreatic secretion are apt to ooze into the peritoneal cavity, preventing the formation of adhesions and favoring the development of peritonitis. This is strikingly shown by comparing the results in 91 cases of resection of the stomach in which the pancreas was not injured, with the results in 30 other cases in which the pancreas was injured by the separation of adhesions. The mortality in the first

series was 27.5 per cent., and in the second series 70 per cent., and most of the deaths in the second series were due to peritonitis.

Great care should therefore be taken to keep the pancreatic secretion from getting into the abdominal cavity. If the conditions are favorable the wound in the pancreas should be turned in and sutured so that the gland is completely covered by peritoneum. If this procedure is unsuccessful or doubtful the exposed portion of the pancreas should be drained by gauze. This is equally important whether the pancreas is inflamed or simply injured. The mortality in a series of 70 reported cases is about 40 per cent. after drainage, and 80 per cent. without drainage.

Operative treatment of the pancreas may be required on account of (1) injuries ; (2) inflammatory processes, including hemorrhage and calculi ; and (3) new-growths, including cysts.

*Injuries.* The diagnosis of these cases can rarely be made with certainty. Injury of the pancreas should be borne in mind if the force has acted upon the epigastric and umbilical regions, and especially if the stomach is found to be injured when the abdomen is opened. In these doubtful cases a median incision is most satisfactory. The results in the comparatively few recorded cases of pancreatic injury are as follows : 5 gunshot wounds treated by operation, with 2 deaths and 3 recoveries ; 7 gunshot wounds treated without operation, all fatal ; 9 stab wounds treated by operation, with 8 recoveries and 1 death. In several of these cases the pancreas prolapsed through the abdominal wound, but was only slightly injured.

In the 24 cases of subcutaneous injury, 13 patients were not operated upon, and all died. Of the 11 operated upon, 7 recovered ; 3 patients were operated upon early, within four days after the injury ; 1 of these recovered and 2 died. The operation consisted in exposing the injured pancreas and in drainage. Eight times the operation was done late ; that is to say, after one or more weeks the haematoma arising from the pancreatic wound was opened and partly drained ; 2 of these patients died and 6 recovered.

Not every injury of the pancreas is an indication for operation. The latter rests rather upon the severity of all the symptoms, and especially upon increasing anaemia, the physical signs of blood in the abdominal cavity, and peritoneal irritation.

*Inflammatory Processes.* Surgical interference is indicated particularly in those cases in which the *pancreatitis* is a purely local condition. The pancreatic duct, like the common bile duct, is easily infected from the duodenum.

The surgeon will, accordingly, bear in mind the following points in considering the etiology of acute pancreatitis :

1. The very slight tendency of pancreatic hemorrhage to stop spontaneously.
2. The locally destructive and the general toxic action of the pancreatic ferments set free by the inflammatory and hemorrhagic processes.
3. The ease with which the pancreas may be infected from the ductus choledochus.

There is hardly a region in which a focus of infection can be more unfavorably placed. Not only is the patient threatened with severe toxic and general septic symptoms, but he is also exposed to a progressive general peritonitis. It is not surprising, therefore, that most surgeons hesitate to advocate early operation in acute pancreatitis. Still a few men have reported cures obtained by operation and drainage of the omental bursa or of the pancreas itself. The results of operation in later stages of the disease are more favorable than those obtained by early operation ; but, in view of the meagre data at hand, this is a comparison of little value.

The close relation existing between chronic pancreatitis and diseases of the biliary tract has been recognized in the last few years, and a number of successful operations have been reported. In these obscure cases an exploratory incision is strongly recommended. If an impacted biliary calculus is found in the common bile duct or in the papilla of Vater it should be removed and the ducts drained. A more indirect method of cure is the performance of cholecystostomy or cholecystenterostomy. The risk of biliary infection in these cases is lessened by an enterostomosis placed about four inches away from the point of anastomosis between the intestine and gall-bladder.

**New-growths, Including Cysts.** Park,<sup>1</sup> in discussing this part of the surgical treatment of the pancreas, says that the symptoms produced by a cyst depend a good deal upon its size. He disbelieves in puncture for diagnostic purposes on the ground that it introduces new elements of danger and because exploratory laparotomy is more satisfactory.

In making the diagnosis one has to consider generally :

1. Local peritonitis with fluid accumulation.
2. Cholecystitis and distended gall-bladder.
3. Hydronephrosis and other fluid tumors of the kidney.
4. Ovarian cysts.
5. Hydatid and other cysts of the liver.
6. Adrenal cysts.
7. Mesenteric cysts, including cysts of Müllerian and Wolffian remains in the mesocolon.

<sup>1</sup> Loc. cit., p. 80.

8. Omental cysts.
9. Splenic cysts, hydatids, etc.
10. Cysts of the stomach wall, which have, in at least two cases, closely simulated pancreatic cysts.
11. Retroperitoneal lymph and other cysts.
12. Collections of fluid in the omental bursa, which often contain pancreatic fluid, and are sometimes called pseudopancreatic cysts.

**TREATMENT.** Aspiration of pancreatic cysts is not recommended. If a cyst is to be drained it is best to anchor it to the abdominal wall, and then to drain it through a small incision. This can be accomplished at one sitting. If the wall of the cyst is very thin, or for some other reason there is risk of escape of fluid into the peritoneal cavity, the operation may be completed at a second sitting. In many cases posterior drainage is preferable, usually at the left costospinal angle. While an anterior drain may be flexible or stiff, the posterior drain should always be flexible. Experience has shown that drainage of the pancreatic cyst is often followed by prompt recovery and no disturbance of the pancreatic function. It has also shown that pancreatic fistulæ may persist for a long time without apparent detriment, and may be expected to close with or without treatment after a somewhat indefinite period.

The cases are rare in which it is practicable to enucleate a pancreatic cyst.

Solid tumors of the pancreas probably are not found more frequently than once in four or five hundred autopsies. The commonest tumor is carcinoma, and the head of the gland is its usual seat.

The symptoms of tumor are disturbances of digestion, to which are added the symptoms of pyloric stenosis if this portion of the alimentary tract is obstructed. Fatty stools are rare; light-colored or bloody stools are more common, as are voluminous stools due to incomplete digestion. If this symptom is followed by jaundice and then by glycosuria, with epigastric pain and emaciation, there is probably a pancreatic cancer. Pain is an uncertain symptom. When characteristic it radiates around the sides to the back, and may be severe. It may simulate the crisis of tabes, but it lasts longer, and is often worse at night. It has been spoken of as "coeliac neuralgia." It is sometimes paroxysmal, colicky, or anginal. When pain is severe there is accompanying tenderness.

Jaundice may develop early, but is usually a late symptom, due to extension of the disease beyond the limits of the pancreas. A tumor is detected sooner or later according to the thickness of the abdominal wall. If pain, jaundice, and tumor are present the disease runs an active course.

Later symptoms are secondary nodules in the liver, ascites from pressure on the portal vein, or involvement of the peritoneum, and bronzing of the skin from involvement of the adrenals.

Cachexia occurs earlier and is more pronounced than in cancer of other organs. Death results from marasmus, hemorrhage, or obstruction within a few months, or sometimes within a few weeks.

Operation has rarely been performed sufficiently early to be of benefit. There are on record some sixteen instances of operation, in eight of which death followed within a few hours or days.

In discussing this paper Richardson<sup>1</sup> said acute infections comprising the whole gland permit only drainage, and that drainage, unless it be to the left flank, as well as through the epigastrium, is up hill. Drainage does not check the progress of necrosis; sphacelation and removal of the spachetus are requisite to recovery. The patient, therefore, who resists successfully a most formidable onset must withstand a violent and exhausting suppuration in the heart of the abdomen, deprived of the most important, if not essential, organ of nutrition. But there are suppurations apparently dependent upon less extensive necrosis, well-localized abscesses of comparatively slow onset, and mild curve, which are easily drained by a simple incision. Unless much more is learned concerning acute infections of this important organ, and especially its earliest manifestations, the future promises little improvement upon the present results of surgical treatment of acute pancreatitis. It is in the treatment of aseptic conditions, whether cysts, neoplasms, stones, chronic enlargements, or wounds and injuries, that surgery has a successful, brilliant, and encouraging, though limited field. Even in traumatic conditions, however, through the baneful local influence of the pancreatic secretions, the outlook for successful treatment is always grave. On the whole, therefore, the surgery of the pancreas is encouraging, even in the most aggressive lesions. This field of surgery cannot rival that of the gall-bladder or of the appendix in the wide applicability of surgical measures or in the almost invariable success of them. It is a field, however, which encourages abundant research, the results of which, let us hope, will add a new chapter to the brilliant achievements of medicine and surgery.

**Relations of Disease of the Biliary Passages and those of the Pancreas.** Moynihan,<sup>2</sup> in speaking of the relations between disease of the biliary tract and that of the pancreas, says: "The great majority of our cases of chronic pancreatitis have been discovered simply because we have gone a step farther in our gall-bladder operations. I have personally operated on fifteen cases of chronic

<sup>1</sup> Loc. cit.

<sup>2</sup> Loc. cit.

pancreatitis, and all have recovered, two of them being especially interesting. In one of them the operation was done a year ago, the diagnosis having been made of floating stone, and a history having been given of gallstones, but none were present in the ducts. There was very marked chronic pancreatitis affecting more than one-half of the gland. There were also many other symptoms, especially marked polyuria, the patient passing from eighty to ninety ounces daily. No sugar was present in the early part of the disease, but developed later. I drained the gall-bladder for some time, but did not do a cholecyst-enterostomy. Satisfactory progress has been made, and pain has been relieved, but five months ago glycosuria developed, and the patient is dying from diabetes. The second case was diagnosed as chronic pancreatitis, and a calculus was found in the pancreatic duct, the diagnosis having been made with some certainty beforehand. On opening the abdomen I removed the stone, which was found to be composed of carbonate of lime. This is the first occasion on which a pancreatic stone was diagnosticated and found by operation. Mr. Robson recently had the same experience. As to acute pancreatitis, we have had a comparatively small experience. I have talked it over with several surgeons, but could not find more than seven or eight cases. I have had two, but I do not seem to be able to collect more than seven or eight. Both of my cases were associated with cholelithiasis, one recovering without operation, and the other died. Large cysts were found, and the contents, which I had examined, were found to be sterile. I wish again to bear testimony to the excellent work that is being done on this side of the Atlantic, as it has thrown considerable light upon the subject."

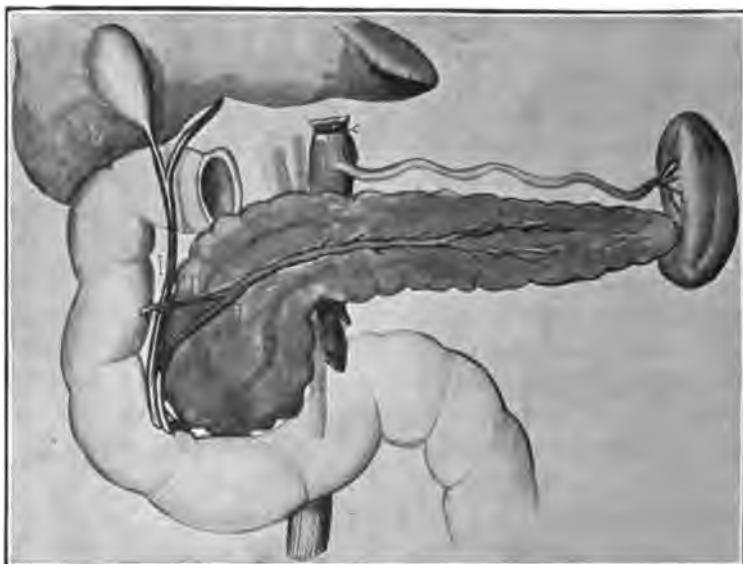
**Chronic Pancreatitis.** Hardin<sup>1</sup> describes a case of chronic pancreatitis occurring in a woman aged forty-nine years, in which relief of all symptoms was obtained by drainage of the gall-bladder. The diagnosis of chronic pancreatitis is often extremely difficult. In the present state of our knowledge of the disease it rests upon the jaundice, the paroxysmal epigastric pain, the epigastric resistance and tenderness, the rapid loss of flesh and strength, with absence of marked anaemia or leukocytosis, the presence of an excess of undigested muscle fibre in the stools, and a peculiar reaction of the urine mentioned by Cammidge. He found that if the urine of a patient with chronic pancreatitis is boiled with an oxidizing agent, and then is tested with phenylhydrazin, a number of delicate yellow needles arranged in sheaves and rosettes are formed. However, in many cases exploratory operation is necessary to establish a positive diagnosis. Robson, whose work in

<sup>1</sup> American Medicine, 1903, vol. v. p. 291.

this field is well known, formerly believed that all cases of chronic pancreatitis are due primarily to obstruction by calculi. The accompanying illustrations show very well how biliary and pancreatic calculi may obstruct the flow of pancreatic juice. (Figs. 39, 40, and 41.)

There are, however, several cases on record in which there was shown no antecedent history of gallstones, and in which there was no evidence of calculus. If the inflammation of the pancreas is due to micro-organisms, their action must be greatly favored by obstruction to the pancreatic duct, and the presence of gallstone in the common duct is undoubtedly the primary cause in a large majority of cases.

FIG. 39.



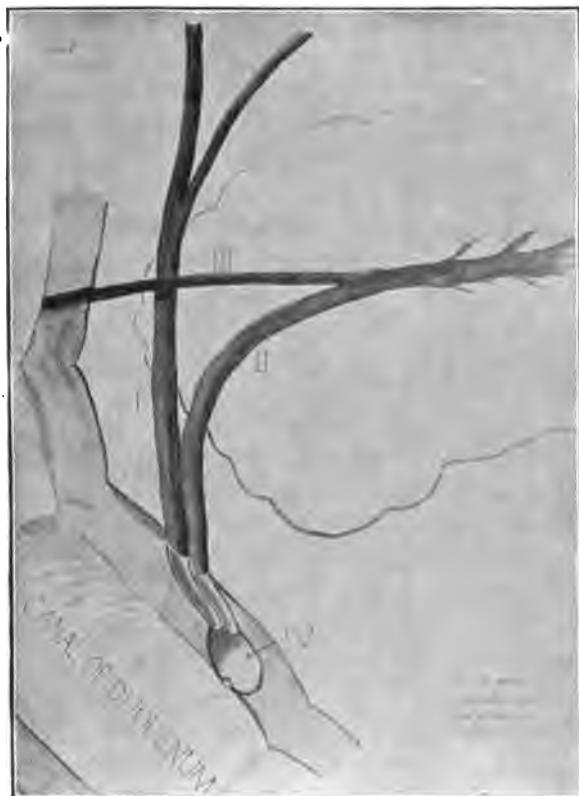
I. Common bile duct. II. Pancreatic duct. III. Duct of Santorini.

Barling<sup>1</sup> mentions a case of chronic inflammation of the pancreas occurring in a patient who suffered for a long time from epigastric and right hypochondriac pain, vomiting, and jaundice. The diagnosis of gallstone colic was made, but at operation no gallstones were found. The head of the pancreas was enlarged and hard. The patient recovered, but four years later he suffered from the same symptoms, with marked loss of flesh. He was operated upon a second time, the gall-bladder being opened and drained of foul fluid, which contained two small gallstones. So long as the fistula persisted the patient was relieved, but this kept closing, and therefore a third operation was

<sup>1</sup> British Medical Journal, 1903, vol. i. p. 956.

performed, and the gall-bladder was anastomosed with the colon. The patient's condition was improved, but seventeen days after operation he died of hemorrhage from an ulcer in the gall-bladder. There were no calculi in the biliary or pancreatic ducts, nor any stricture. The pancreas was very dense, presenting evidences of old chronic interstitial pancreatitis. Barling considers that this patient would have been permanently cured if at the first operation an anastomosis had been established between the gall-bladder and the intestine.

FIG. 40.

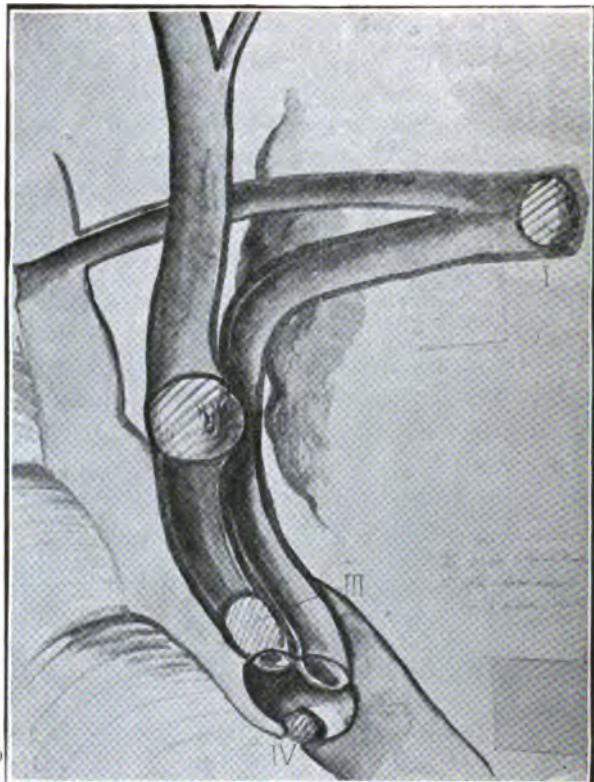


I. Common duct. II. Pancreatic duct. III. Duct of Santorini. IV. Diverticulum of Vater.

**Pancreatic Diabetes Cured by Fixation of the Right Kidney.** Observations of the past few years have shown that diabetes is closely associated with pancreatic function in a great many cases. There is a very close relation between the pancreas, duodenum, and right kidney. Fixation of the head of the pancreas depends upon the duodenum. The extremities of the duodenal ring are the only positively fixed portions of the duodenum, and they separate the head from the neck of the

pancreas, so that the neck will be the centre of the radius for any motion that occurs in the duodenal ring and pancreas. Interference with the functions of the stomach is one of the common symptoms in movable right kidney. Brown,<sup>1</sup> in view of the close relations mentioned above, decided that traction and pressure of a misplaced kidney were responsible for the glycosuria which was present in two of his patients. The urine of one of these patients contained more than 10

FIG. 41.



I. Stone in pancreatic duct. II. Gallstone in common duct. III. Stone in common duct. IV. Stone in ampulla of Vater.

per cent. of sugar. This was reduced to a small amount by a suitable diet, but did not entirely disappear. After the kidney was stitched in its proper position the sugar disappeared from the urine entirely and did not afterward recur, although the patient suffered subsequently from an attack of grip, and was operated upon for pelvic trouble. The disappearance of the sugar after nephropexy was equally striking in Brown's second case.

<sup>1</sup> Philadelphia Medical Journal, 1903, vol. xi. p. 594.

# GYNECOLOGY.

BY JOHN G. CLARK, M.D.

## THE UTERUS.

**Cancer of the Uterus.** In pursuance with our policy relative to a comprehensive review of the literature on carcinoma, we note almost innumerable articles bearing upon the various phases of cancer of the uterus. Thus, in Frommel's year-book on the *Progress of Obstetrics and Gynecology* for 1903, 280 references are made to more or less important contributions to this subject. It is neither possible to review all of these articles nor is it desirable, for many of them are mere repetitions of much that has already been said on the subject. Indeed, the dearth of really new suggestions or ideas is as great in the one direction as the extent of literature in the other. It is only by thoroughly sifting this mass of literature that we are able to add anything of special interest to the subject as presented in previous years. Cancer, however, is the all-important topic at present in surgery, and only by the most thorough review of the literature, the closest observation of cases, and the careful weighing of all of the evidences before us will the final and radical cure of this dreadful disease be accomplished.

In one phase of the literature during the last year there has unquestionably been a radical change, in that vaginal hysterectomy, the all-pervading operation of only four or five years ago, has been largely abandoned under the impulse arising from the repeated publication of papers in Germany and Austria concerning the so-called Wertheim method. The chief burden, at least of the German literature, is the report and discussion of this more radical method of operating.

**ETIOLOGY.** There seems to be a growing belief in the minds of many observers that carcinoma of the uterus is increasing in frequency. Bollinger<sup>1</sup> reviews the statistics of Finkelnburg, Gilbert, Nencki, Behla, and others with regard to this point which, if proved, would favor the infectious nature of the disease. While the authors mentioned have in general discovered a larger percentage of cases of carcinoma during the past few years than heretofore, Bollinger finds from reliable

<sup>1</sup> Münch. med. Wochens., Bd. I., No. 38.

statistics, at Munich, data which lead him to believe that the results of such investigations are often misinterpreted. In Munich the increase of cases of carcinoma during the past thirty-three years bears a direct relation to the increase of population, and there is, therefore, little if any actual increase in the proportion. Where such an actual increase does exist a number of explanations for the discrepancy between the figures of Bollinger and of other observers may be given.

1. Carcinoma is more frequently diagnosticated at present than it has been in the past, autopsies are more carefully performed, and cases come into the hands of physicians with more regularity.

2. The death-rate from typhoid fever, tuberculosis, and sepsis has been lowered by the advancement in hygienic regulations and therapeutics. But as the prognosis in carcinoma is little better than formerly, the number of deaths from this disease appears relatively increased, although there is no actual increase.

3. In a large city there may be an actual increase due to the fact that many persons affected with the disease seek treatment in the public clinics much more frequently than before free dispensaries were established. This actual increase must, of course, be discounted in our estimation of the frequency of carcinoma as a whole. Bollinger believes that the estimated percentage of carcinoma in cities or large towns will always be larger than in the country, both for the reason last given and because in the country the patient less often comes under the observance of a physician and the diagnosis is less frequently made. If carcinoma is an infectious disease his very pertinent query is why so few cases occur except after middle life, whereas in other infections the young are especially predisposed.

Marchand<sup>1</sup> believes that there has been no proof of the parasitic nature of carcinoma. He goes farther than this and says that the so-called parasites are nothing more than cellular products (vacuoles in the protoplasm). It is better, he thinks, to abandon the parasitic theory and its investigation and look in another direction for the real cause of malignant growths. After discussing exhaustively all of the theoretical possibilities he comes to the conclusion that the malignancy of epithelial new-growths is only to be explained upon the assumption that there is a toxic substance produced by the cell which depends for its formation and accumulation upon a degeneration of the cell—*i. e.*, upon a departure from its normal metabolic process and at the same time its normal cell structure—or, in other words, upon the loss of the normal physiological cellular activity.

This degeneration may vary considerably both in degree and in quality.

<sup>1</sup> Deutsche med. Wochenschrift, 1902, No. 39 and 40.

Marchand's position as a pathologist is so eminent and his steps in all new advances so cautious that we must give the fullest possible weight to his theories. From my own standpoint, the parasitic theory of carcinoma has been an attractive one, but the verdict thus far is unquestionably that of the Scotch jury, "not proven." Certainly, as yet, no well-sustained series of experiments have shown that a parasite capable of transmitting the disease from one animal to another has been discovered. Therefore this theory has not been strengthened, but rather weakened during the past year. While this much may be said of the parasitic origin of cancer, it may likewise be said that Marchand's hypothesis as to a pathological metabolic process is unsupported by clinical or other positive data. We are, therefore, not any nearer the solution of this intricate riddle than was Cohnheim several years ago.

**GENERAL ASPECT OF THE CANCER QUESTION.** With the exception of minor details, the more radical operations are all based upon the theory of early metastasis, especially emphasized by Reis, and follow the general principles incorporated in his operation and the one which I independently described shortly after the publication of Reis' article. Werder, of Pittsburg, has likewise published a description of his operation, which takes precedence over that of Wertheim, so far as priority is concerned. Reis still maintains his position as to the necessity for the radical operation. Werder has not recently given expression to his convictions after a more extended experience with his operation. As to my own experience, I reluctantly express my skepticism of the value of the more radical operations as a permanent curative measure. No one has more enthusiastically championed the radical method than I, and yet an increasing experience with the operation gives rise to the growing conviction that the removal of the glands, as I have frequently of late expressed myself, is of prognostic rather than of curative value. Clinically, my belief is, "In the event of metastasis to the glands the most radical operation will not cure the disease." That the abdominal operation is always preferable to the vaginal is also my firm conviction. Much more cellular tissue adjacent to the uterus and a broader cuff of vagina may be removed by this method than by vaginal hysterectomy, and the paramount value of the operation lies in this fact, for local recurrences are the rule after all operations; therefore, the greater the amount of local tissue excised the better the chances for cure. In my opinion the permanent cures occur in the cases in which metastasis to the lymphatics have not occurred.

It is, therefore, questionable whether the efforts of recent years to perfect the surgical treatment of carcinoma have resulted in a more

favorable outlook for the victims of this disease. Thus Olshausen,<sup>1</sup> who has always advocated vaginal hysterectomy, believes that the furor for the abdominal operation will spend itself and in time will be modified. He has had 18 per cent. of permanent cures following vaginal hysterectomy. He believes complete removal of connective tissue and glands from the pelvis is impossible and that abdominal hysterectomy may be the operation of election more with a view to the prevention of injury to the ureters, when these structures are surrounded by the disease, than for the purpose of extirpating the glands or the connective tissue. There seems to have been a general realization of the futility of any operative procedure in late cases of carcinoma, and many suggestions have been offered to emphasize the importance of its early recognition.

Winter<sup>2</sup> has observed 240 cases of carcinoma in his clinic, and 57 per cent. of these were subjected to radical operation. In 40 per cent. the parametrium was free. In all Germany he estimated the number of existing carcinomata of the uterus at 25,000. Upon the first appearance of symptoms Winter believes the disease is always operable. It should be the imperative duty of the physician not only to advise operative relief for carcinoma, but ever to be vigilantly upon the alert to discover the disease in its incipiency, so that an immediate operation may be performed. To this end Winter recommends:

1. Letters and pamphlets from the larger clinics to physicians, in which they are requested to send excised tissue or curettings from suspicious cases, and containing a short description of the method of obtaining and preserving this material.
2. Pamphlets to midwives.
3. Suitable articles for publication in the daily press.

He well realizes the effect that such communications might have upon hysterical individuals. That his ideas are in the right direction he concluded from the fact that since the beginning of the year, when he sent out such an article to physicians, he has received sixteen specimens for examination, five of which proved to be carcinomatous.

J. K. Kelly<sup>3</sup> asks what can be done by the medical practitioner to diminish the frequency of inoperable cancer of the uterus. He believes with Winter that the main reason for the hopelessness of so many cases lies in the want of an educated public opinion. The public, and especially the female public, is not sufficiently well informed as to the symptoms of cancer to lead them to consult their physicians in time. There are many false ideas prevalent among women as to the menstrual

<sup>1</sup> Zentralbl. f. Gynäk., 1903, No. 29.

<sup>2</sup> Glasgow Medical Journal, April, 1903.

<sup>3</sup> Ibid., p. 887.

flow. Amenorrhoea appears far more significant to them than an increased frequency or an increased amount of the menstrual flow. A woman near the menopause will come to her physician with many trifling ailments far more quickly than for an increased frequency of menstruation. This she may view with complacency, perhaps even with a feeling of satisfaction that at her age she is so healthy, "indeed, healthier than she used to be, as her monthlies come now every fortnight instead of every four weeks."

The education of public opinion in medical subjects depends upon the general medical practitioner. What medical men of one generation know about disease becomes the property of the public of the next generation. We want, therefore, first an appreciation by the medical practitioner of the importance of the early recognition of cancer, and if this once is established it will soon be recognized by an intelligent contemporary public. To this end Dr. Lewers, in his recent work on *Cancer of the Uterus*, suggests that a cancer commission or some recognized medical institution should issue a leaflet mentioning the essential facts which it is desirable that women should know concerning the early indications of cancer, and especially regarding atypical uterine hemorrhage. The leaflet might be distributed by physicians to nurses, district visitors, and to all who could put such knowledge to the proper use. As cancer seems to depend upon laceration of the cervix, Kelly would recommend the greatest care in preventing it, and if it does occur he advises an immediate repair. Cervical catarrh, gonorrhœa, or any source of prolonged irritation to the cervix, he believes, are predisposing factors in carcinoma, and if possible should promptly be cured. He would advise immediate pelvic examination in every woman past the prime of life who presents symptoms of pelvic disorder, however trifling. If one waits for the classical symptoms, pain, hemorrhage, and discharge, before making an examination, the disease will almost always be discovered too late. In early doubtful cases he heartily recommends histological examination of the suspected tissue.

**Histological Examination of Carcinoma.** Anspach<sup>1</sup> reviews the results of the routine histological examination of curetted portions of the endometrium and excised cervical tissue in my clinic at the University Hospital. It is the custom there to examine all curettings and all excised cervical tissue. This is done irrespective of the clinical diagnosis. In two cases within the past year unsuspected carcinoma of the fundus has thus been discovered. So far carcinoma of the cervix has never been diagnosticated by this means alone. The clinical diagnosis in every case of cervical cancer was positive or

<sup>1</sup> Transactions Philadelphia County Medical Society, December 31, 1903.

strongly suggestive. Many suspicious cases, however, have been settled one way or the other, and no mistakes so far have been made. The author draws attention to the fact, however, that cases seen in hospital service are usually advanced, and that the percentage of cases coming to the surgeon, in which the carcinoma has not passed beyond the cervix, barely reaches 40 per cent. He believes that to the experienced gynecologist histological examination of cervical tissue is not so important as to the general practitioner, who has less opportunity to familiarize himself with the differential clinical diagnosis between benign and malignant affections. While the physician might have difficulty in sending a patient to a consultant unless she has well-marked symptoms which appeared serious, even to the patient herself, it would be comparatively easy to perform curettage and excise the suspicious cervical tissue and submit the specimens for histological examination. In this way he believes many cases of early carcinoma, both of the cervix and of the fundus, might be recognized. This is also my opinion; furthermore, I believe that a man who has been especially trained in gynecological pathology will make few mistakes in a histological diagnosis. Noble and Beyea share similar opinions, and the latter reports a case in which an unsuspected case of cervical carcinoma in his own hands was discovered by the use of the microscope.

As there seems to be more reliance placed upon the histological diagnosis of carcinoma now than in previous times, any new points in the microscopic anatomy of cancer are of practical importance and deserve attention. Carcinoma of the uterine fundus is, as a rule, a glandular growth, therefore, although we read of the occurrence of squamous cancer in this area, it receives little consideration. In examining curettings from the endometrium it is the tendency, and rightly so, to regard pieces of tissue composed of several layers of squamous epithelium as a portion of the normal mucosa of the vaginal cervix, which has been scraped off by accident. This is not an infrequent occurrence, and the source of such an epithelial strip is usually evident to the experienced observer, because of the marked regularity of the epithelial cells. Zeller,<sup>1</sup> however, has described a metaplasia of the normal cylindrical cells of the endometrium into stratified squamous epithelium, which may be due to any form of chronic endometritis. He designated this condition *psoriasis uteri*. Wertheim<sup>2</sup> and Menge<sup>3</sup> have reported somewhat similar metaplasias in gonorrhoeal endometritis. The occurrence of such a process must be extremely seldom, for Ruge and Gebhard have never seen a case. There is good reason, therefore,

<sup>1</sup> Zeitsch. f. Geb. und Gyn., Bd. xi. p. 56.

<sup>2</sup> Verhandl. d. D. Ges. f. Gyn., Wien, 1895, Bd. vi. p. 1.

<sup>3</sup> Bacteriolog. des Weiblech. genital Kanals, Leipzig, 1897.

to give attention to the work of Hitschmann,<sup>1</sup> who found seven cases of adenocarcinoma of the fundus uteri during the past two years in Schauta's clinic in which there was marked transformation to squamous epithelium through metaplasia of the cylindrical epithelium of the surface and of the glands. He believes that this metaplasia is more or less limited to malignant growths of the endometrium, and that in any case where such a metaplasia is found there is a probability of malignancy even though no cancer is present. A psoriasis or an ichthyosis uterina, except in the presence of malignancy, he has never observed. He found in three cases a primary squamous-celled carcinoma of the fundus. In the light of Hitschmann's work stratified squamous cells found in uterine scrapings acquire a new significance. During the past year I have had a case in my own service in which my assistant, Dr. Anspach, found such a metaplasia. In this case a general pathologist of the greatest ability regarded these metaplasias as either surface epithelium cut diagonally or as portions of the cervical mucosa.

In last year's PROGRESSIVE MEDICINE I drew attention to the observations of Winter, Zangemeister, and Kroenig upon the vesical changes that frequently occur in the presence of carcinoma of the cervix. If these alterations represented actual invasions of the malignant process their presence would, of course, contraindicate to a very great extent any serious attempts to eradicate the disease by surgical intervention. During the past year Hirt and Sticher<sup>2</sup> examined the bladders of fifty-four women who had carcinoma of the cervix. They say that from the present standpoint of our knowledge papillary growths, nodes, flat, elevated protuberances, and ulcers of the bladder found in connection with carcinoma of the cervix do not indicate that the bladder is not involved by the malignant affection, and that, therefore, any attempt at total extirpation is hopeless. Cases with actual carcinomatous lesions of the bladder do occur, but only in very advanced carcinoma. Cystoscopy unfortunately is not sufficient to determine whether suspicious growths of the vesical mucosa in this class of cases are carcinomatous. This is possible only by endovesical excision of tissue and histological examination. They believe with Winter that the connection between carcinoma of the cervix and alterations in the vesical mucosa depends not upon the carcinoma itself, but upon an associated disturbance of the circulation. Such a disturbance producing similar bladder lesions may be seen in paravesical inflammatory processes. The configurations of the mucosa, moreover, in carcinoma resemble very much those produced by cystitis,

<sup>1</sup> Archiv f. Gynäk., Bd. lxix., Heft 3.

<sup>2</sup> Deutsche med. Woch., Bd. xxix., No. 45.

existent or bygone, and even correspond very often to the physiological tendency of the bladder mucosa to undergo proliferation. These alterations can, therefore, only with the greatest care be brought into an etiological relationship with uterine cancer. On the other hand, in spite of firm adhesions between the cervix (cancerous) and the bladder, changes in the vesical mucosa may be entirely wanting.

**INOOPERABLE CANCER.** In last year's PROGRESSIVE MEDICINE I reviewed Kroenig's suggestion for inoperable cases of carcinoma and cited one case in which the operation was quite useless. During the past year there have been observations which indicate that the results of Kroenig's treatment vary considerably.

Biermer<sup>1</sup> reports a case of inoperable carcinoma of the cervix in which he adopted the plan of Kroenig, viz., bilateral ligation of the ovarian and internal iliac arteries. Because of a thyroid tumor which produced considerable dyspnoea when the pelvis was elevated, and because the carcinoma involved the vaginal vault and parametrium, he had to be content with palliative means. He chose Kroenig's method in lieu of cauterization and curettage on account of the danger of perforating the adjoining viscera. The patient had a normal convalescence except that she complained several times of chilliness, although there was no elevation of temperature. The results of the operation are striking, but hardly desirable. The hemorrhage and suppuration immediately subsided. The carcinomatous ulcer, four weeks after the operation, was diminished a half, and in spite of vigorous digital examination did not bleed. The uterus was diminishing in size. The general condition of the patient, however, suffered. She complained of pain in the muscles of the buttocks. She walked bent over, with her arms resting upon the upper part of the thigh. This the author attributes to a trophoneurotic disturbance in the muscles of the pelvis and buttocks due to impoverishment of their blood supply.

Stoltz<sup>2</sup> reports seven cases of ligation of the arterial supply in inoperable carcinoma of the cervix. Four healed without any complications, although the results were no better than after cauterization and curettage. After four weeks they bled as freely as before, and at that time cauterization was required. He does not recommend the procedure.

The tying of the iliac arteries in inoperable cancer of the uterus should unqualifiedly be condemned. H. A. Kelly demonstrated six or eight years ago that this treatment was of no avail. As in this case of Biermer, the last condition is as bad or worse than the first; or, in other words, it is a case of "out of the frying pan into the fire." This treatment is only mentioned to be condemned.

<sup>1</sup> Zentralbl. f. Gynäk., 1903, No. 7, p. 207.

<sup>2</sup> Ibid., No. 29, p. 889.

**TREATMENT OF CARCINOMA OF THE UTERUS.** The radical operation for carcinoma has not been especially modified during the past year. In last year's PROGRESSIVE MEDICINE I described in detail the operation as performed by Wertheim, Amann, Mackenrodt, von Rosthorn, Kroenig, and others. Wertheim and Mackenrodt<sup>1</sup> still believe in the value of their methods and continue to employ them. I have not been able to find anything from any of the other writers, and conclude, therefore, that they have not altered their operative technique.

Olshausen<sup>2</sup> still adheres to vaginal hysterectomy except in cases in which the ureters are closely involved.

With regard to the technique of vaginal hysterectomy the operation of Schuchart's by means of a paravaginal incision does not seem to have been improved upon. Schauta<sup>3</sup> and Staude<sup>4</sup> have well described the technique in these cases. Their results were given in detail in last year's PROGRESSIVE MEDICINE. No improvements in the vaginal operation have been noted during the past year. In my opinion Schuchart's operation is not to be recommended. It is not surgical and is quite as difficult, although said to be simpler than the others.

Wertheim's operation may be spoken of as the conservative advanced radical operation of the day. He has had his views amply justified recently by Kundrat,<sup>5</sup> who has contributed a most valuable article on the extension of carcinomata of the cervix into the parametrial tissues. His conclusions are drawn entirely from actual histological findings, and the technique employed in his research left nothing to be desired. Three years were consumed in this work, and 21,000 microscopic sections were examined. His paper is based upon a study of serial sections made of the parametrial tissue and glands from 80 cases of carcinoma of the cervix operated upon at Wertheim's clinic. The results in these cases may be tabulated as follows:

Both parametria free; regional lymph glands both sides free . . .	32
One parametrium free; " " " . . .	15
Both parametria cancerous; " " " . . .	7
One parametrium cancerous; lymph glands of same side carcinomatous "	7
" " " " other " " . . .	3
Both parametria " " " one " " . . .	7
One parametrium " " " both sides " . . .	1
Both parametria " " " " " " . . .	4
" " free " " one side " . . .	4

Two facts are proved with regard to the significance of induration of the parametrium. In 11 cases the parametrium was found clinically to be infiltrated, and yet Kundrat's sections revealed no carcinoma;

<sup>1</sup> Zentralbl. f. Gynäk., 1903, No. 29, p. 889.

<sup>2</sup> Ibid.

<sup>3</sup> Monat. f. Geb. und Gyn., Bd. xv. p. 133.

<sup>4</sup> Ibid., p. 863.

<sup>5</sup> Archiv f. Gynäk., Bd. lix., Heft 2.

*vice versa* he found carcinoma eighteen times in parametria that clinically gave no evidence of induration. It is true, therefore, that the presence of induration is not positive evidence of carcinomatous involvement, and that the absence of induration in no way excludes the possibility of such involvement. The induration that sometimes exists in the absence of carcinoma he attributes to circulatory disturbance; pressure of the carcinoma upon the cervical vessels results in a slowing of the blood stream in the paracervical tissues; this occasions a diminution in the elasticity of the vessels and a consequent enlargement of the vessel calibre. Compensatorily there occurs a proliferation of the intima which may lead to complete obstruction of the vessel or to thrombosis. Another source of this induration is inflammation pure and simple, which cannot be excluded as a factor because of the frequency with which fresh or old inflammatory adnexal conditions are found in these cases.

Carcinoma of the cervix may extend in one of three ways, and depending upon the variety of extension there are four classes:

1. The disease *en masse* invades the parametrium; there is no line of separation between the original growth and its extension, for it forms a common tumor; 17 of Kundrat's cases belong to this class.

2. The disease is mostly confined to the cervix and bounded by healthy cervical tissue, except at perhaps one point, where projections of the cancer break through and invade in continuo the lymph vessels of the parametrium, especially the perivascular ones and less often those of the nerve sheaths; 9 cases furnish examples of this variety.

3. The disease is confined to the cervix and is surrounded by an intact unbroken border of cervical tissue. In the parametrium, often at a considerable distance, there are carcinomatous metastases either in the lymph nodes or in the lymph vessels; 9 cases are to be included here.

4. In this class we have a combination of 1, 2, and 3. The manner of extension may vary on the two sides in the same case. When Kundrat speaks of metastases to lymph nodes he includes metastases to lymphatic structures which he found in the parametrial tissues. Here in nearly every case he found collections of lymphadenoid tissue, rudimentary lymph glands, which project more or less into the lymph vessels and which he believes form the first detention points for metastatic carcinoma cells. In 17 cases where metastases existed in the parametrium these lymph nodes were involved fifteen times. In but 2 cases were metastatic carcinomatous deposits found in the lymph radicals themselves. This agrees with the findings of Oehlecker,<sup>1</sup> who

<sup>1</sup> Zeit. f. Geburts. u. Gynäk., Bd. xlvi., Seite 288.

thinks that carcinoma cells only infrequently adhere to the smooth endothelium of the lymph radicles, and that they only do this when the lymph circulation is disturbed by pressure from carcinomatous glands. Another important fact Kundrat has determined, viz., that in the many hundred lymph glands that were examined carcinoma if it existed was invariably found in the gland and not surrounding it; neither was there any involvement of the fatty tissue or connective tissue immediately surrounding the gland and connecting it with the parametrium. The review of Kundrat's cases convinces me more strongly than ever that my position is correct: "The removal of the glands is of prognostic rather than of curative value." Let me point to one significant fact: out of 80 cases carefully examined 32 showed no involvement of the parametrium or the glands. Deduct these 32 cases from the total (80) and see whether there is ultimately a greater percentage recovery. In my experience it has been less.

It is to be noted that Emil Reis,<sup>1</sup> in contradistinction to Kundrat, found carcinoma cells outside the gland tissue proper, in the afferent lymphatic radicles. He does not note how often this occurs, and, as his cases have been insignificant in number compared with Kundrat's, it may possibly have been an accidental occurrence.

There is one respect above any other in which Mackenrodt has been far-sighted in devising his plan for the radical cure of carcinoma. He insists again this year<sup>2</sup> upon the use of the cautery knife in the separation of the carcinomatous cervix from the surrounding tissues on account of the danger of implantation of metastases if the tissues are divided in the usual way.

Olshausen<sup>3</sup> reports 6 cases which he thinks leave no doubt as to the occurrence of implantation metastases. In 5 of them, after the removal of an ovarian tumor, there ensued, at a period of two, three, five and one-quarter, seven and one-half, seventeen, and twenty years after the operation, a growth in the abdominal scar that Olshausen believes resulted from particles of the original tumor deposited there at its removal. In 2 of the cases at the original operation the tumors were papillomatous; 2 were carcinoma, and in 1 case of bilateral cysts rupture occurred during their removal. In all of these the tumor which appeared at a later date in the abdominal cicatrix was carcinomatous. In the case of recurrence after seventeen years the secondary growth showed the structure of an ordinary adenomatous cyst of the ovary.

The author believes that these late recurrences are significant because

<sup>1</sup> American Gynecology, July, 1903.

<sup>2</sup> Zentralbl. f. Gynäk., 1903, No. 29.

<sup>3</sup> Zeit. f. Geburts. u. Gynäk., Bd. xviii., No. 2.

of their situation. It is well known that tumors of the abdominal wall are usually of a benign nature. Hence he would be at a loss to explain the malignancy in these cases upon any other grounds than those mentioned. It is striking also that the recurrence made its appearance in each instance upon one side of the scar alone. Olshausen observed 2 cases of vaginal hysterectomy for carcinoma, where the vagino-perineal incision (Schuchart's operation) was employed, in which there was a recurrence of the growth in the lower part of the scar, at a point widely removed from the site of the original growth. That the metastatic growths in 5 of the cases described should have been cancerous is in accord with previous observations concerning the metastases of ovarian cysts. It is impossible to tell how often adenocystoma of the ovary, especially papillary ones, contain small areas of cancer. Whether a benign adenocystoma of the ovary may occasion metastases which become malignant is not yet known, but Olshausen<sup>1</sup> has already reported a large number of cases which make this appear probable. Olshausen explains the lateness of the recurrence in these cases by observing that in the scar, which has but small vessels and where nutrition is reduced to a minimum, the transplanted cells remain for some time inactive, until from some combination of circumstances they begin to multiply and the recurrence becomes evident.

The possibility of implantation metastases is receiving more and more attention, and there have been many suggestions to solve the problem of reducing this possibility to a minimum.

A method to prevent implantation metastases which will appeal more to the surgeon is indicated by the suggestion of Downes, who has perfected the *electric cautery clamp* of Skene, and has advocated it as a means of haemostasis in abdominal surgery. C. P. Noble<sup>2</sup> believes that electrothermic haemostasis offers especial advantages in the treatment of carcinoma of the uterus because :

1. More tissue outside of the uterus is removed or cooked than by the classical methods.
2. All the connections of the uterus are severed either through tissue which has been cooked in the bite of the cautery clamp, or these connections are severed with the electric cautery knife. In this way the lymphatic vessels are sealed by the burning or the roasting process. Whatever the risk of implantation of the cancer upon the field of operation may be by this means, it is greatly lessened or entirely obviated. An exception to the above statements must be noted in that the attachments of the bladder to the uterus are severed in the usual way.

<sup>1</sup> Krankheiten der Ovarien, 2 Aufl., S. 382.

<sup>2</sup> Transactions of the Southern Surgical and Gynecological Association, American Journal of Obstetrics, February, 1903.

3. Much less blood is lost than is usual with the classical technique, and a dry, bloodless field is left after operation.

Downes<sup>1</sup> says that after becoming accustomed to their use hemorrhage may be more quickly controlled by use of the electric cautery clamps than by ligatures. Skene's clamps furnish neither sufficient pressure nor sufficient heat. Pressure of from 600 to 800 pounds is necessary, and the heating apparatus should be such that not more than forty seconds is required for heavy pedicles. He has never observed secondary hemorrhage following the use of his clamps; he has the statistics of about 60 hysterectomies performed by this method; 30 were cases of his own, in 5 others he assisted. In all of these cases but the first three recovery was prompt and uneventful. One of the advantages claimed for this method is the infrequency of post-operative adhesions, and another is the small amount of pain, owing to the fact that no nerves are constricted.

Zinke<sup>2</sup> has employed Downes' clamps in 4 hysterectomies. He subscribes to the statement of Noble that "hysterectomy performed by means of the electric cautery clamp possesses all the advantages of any of the methods heretofore in use, and has in addition certain advantages peculiar to it alone." While I heartily advocate the use of the cautery in removing carcinomatous tissue, I quite as heartily protest against the abandonment of ligatures. It is an unsurgical procedure and will certainly lead to cases of postoperative hemorrhage. Use the cautery, but do not abandon ligatures.

The only suggestion during the past year to still more advance the radical operation has been that of Sampson,<sup>3</sup> who believes that even more extreme measures than those already described is required in cases of carcinoma of the cervix. It is especially important to remove, in hysterectomy for cervical carcinoma, the lymphatics along the pelvic vessels and the entire parametrium as well. In order to reach this end the author recommends extirpation of the parametrium *en masse* with the lymphatic structures (including glands) and fat along the iliac and uterine vessels. If the ureters are adherent to the parametrium their lower portions should be sacrificed, and at the close of the operation the cut ends should be implanted into the bladder. The author advises this course because if the ureters are separated in such cases either their blood supply is deficient, producing later necrosis and fistulae, or the disease recurs in the walls of the ureters. Sampson would recommend this operation even in the very early cases, for here

<sup>1</sup> Transactions of the New York Obstetrical Society, American Journal of Obstetrics, May, 1908.

<sup>2</sup> American Journal of Obstetrics, October, 1903.

<sup>3</sup> Johns Hopkins Hospital Bulletin, vol. xiii., No. 141.

by such a radical procedure there would be a greater chance for a cure. At present this operation requires from two and one-half to three hours. But three such operations have been performed, however, and as any new procedure requires more time before than after its technique has been perfected its duration could be somewhat reduced.

The treatment of any condition must be guided by respect for the immediate general welfare of the patient and by a conservative estimate of the good that may be accomplished. Although Sampson in his operation would remove the parametrium *en masse* with the ureters; although he would remove the lymphatic structures along the iliac and uterine vessels—with all of this the extirpation of every possible seat of metastasis is improbable. Mackenrodt<sup>1</sup> believes that the internal inguinal, round ligament and obturator glands are even more frequently involved than are the iliacs, and makes a point of removing them all. Unless the ureters are actually involved in the cancerous growth they could be freed from the parametrium just as easily as the parametrium can be freed from the base of the bladder, and the dangers of an impoverishment of their blood supply can be obviated by using Wertheim's<sup>2</sup> precautions in exposing the ureter and Kroenig's method of providing suitable drainage. Amann protects the ureter by preserving the main vesical artery and by placing the exposed portion of the ureter along the rectal wall and covering it by a large flap of vesical peritoneum.<sup>3</sup> In cases where the ureter is actually invaded by the cancer, in order to extirpate the growth in its entirety it might be necessary also to excise the base of the bladder, as was advised by Martin, of Chicago, a few years ago. Which would give the greater proportion of ureteral fistula—freeing the ureter in a carcinoma operation after the manner of Wertheim, or transplanting the cut end of one or both ureters into the summit of the bladder as advised by Sampson?

PROGNOSIS OF CARCINOMA. In this day, when the question of prognosis from the use of any therapeutic agent in the treatment of carcinoma is so important, everyone should take care lest he ascribe to any form of treatment curative properties that it does not really possess. When a disease is reported as being cured it should mean that it has been entirely eradicated and will never recur; at any rate, at its original source. Pertinent to this fact Olshausen<sup>4</sup> details three late recurrences of carcinoma at four and one-half, seven, and twelve years. Although Volkmann's statement that most recurrences of carcinoma

<sup>1</sup> Zent. f. Gynäk., 1902, No. 45.

<sup>2</sup> Monat. f. Geb. und Gyn., Bd. xv., Heft 6.

<sup>3</sup> Zeit. f. Geburts. u. Gynäk., Bd. xviii., No. 2.

<sup>4</sup> Ibid., Bd. xvi., Heft 3.

recur within two, at most three, years after operation may hold true in carcinoma of the breast, it is not true with respect to carcinoma of the uterus. Of 169 patients in which hysterectomy was performed for carcinoma in Olshausen's clinic from 1892 to 1895, the time of recurrence may be indicated as follows:

Free of a return after two years . . . . .	74.00 per cent.
" " " three " . . . . .	62.60 "
" " " five " . . . . .	38.85 "

Thus, in the fourth and fifth years 23.75 per cent. of the recurrences occurred. Other late recurrences of carcinoma are reported by Schmidt (eleven years after amputation of the breast), Sorgenfrei (twelve years after excision of epithelioma of lip), and by Olshausen himself (implantation metastases in the abdominal scar after five and one-quarter, seven and one-half, and nineteen years).

Edwards<sup>1</sup> reports various affections cured or improved by the *x*-ray; 4 cases of cervical carcinoma in particular are of interest. The first patient aged seventy years had a large cauliflower cancer of the cervix and vaginal vault. After six months' treatment there was no hemorrhage, no pain, and the mass had sloughed away. The patient is in good health, and the treatments are being continued. Second, patient aged fifty-seven years had an infiltrating carcinoma of the cervix. It had been previously treated by curettage and cauterization. It rapidly improved, but after twenty treatments the patient became negligent and did not return. Third patient, aged forty-three years (September, 1902) had carcinoma of the cervix involving two-thirds of that structure. After twenty-seven treatments in two months the growth disappeared and has not recurred. Fourth patient, aged forty years (October, 1902) had a lesion of the cervix the size of a cherry, presumed to be carcinoma. After eighteen exposures in two months it disappeared and there has been no evidence of its recurrence.

If we criticise these cases we find that 1 patient is still being treated, 1 has disappeared, and that in 2 the diagnosis of carcinoma was not verified by histological examination. Moreover, hardly more than a year has elapsed since the growth disappeared, and we are not told whether any exposures have been made during that period.

Scully<sup>2</sup> also reports 3 cases of carcinoma of the cervix benefited by the *x*-ray. His cases are still under treatment.

We naturally turn, in view of these confusing statements, to the remarks of Pancoast,<sup>3</sup> who gives a reliable estimate of the value of the

<sup>1</sup> International Journal of Surgery, October, 1903.

<sup>2</sup> Annals of Gynecology and Pediatrics, Boston, May, 1903.

<sup>3</sup> Transactions of the Medical Society of the University of Pennsylvania, University of Pennsylvania Medical Bulletin, December, 1903.

*x*-ray in the treatment of carcinoma. A *small* number of cases are cured by the *x*-ray; there are many in which more or less improvement is noted; and even in hopeless cases there is relief from pain. In some there is no relief except from the use of morphine. The recent trend of thought is to continue the use of the *x*-ray in cases, apparently cured, for a considerable length of time after the growth has disappeared. Recurrence is nearly always the rule unless this precaution is observed. Pancoast says that operation should precede *x*-ray treatment in all cases, and that when the growth is operable no one is justified in advising the use of the *x*-ray alone. If the growth recurs the same principles obtain.

Morton<sup>1</sup> would emphasize the fact that the *x*-ray should be used in every case of cancer, for it will inhibit the spread of carcinoma before and will prevent its recurrence after operation. Recurrences, he believes, are due to an infection of the lymphatics in the line of incision, or to the fact that, although an excision seems wide and made through healthy tissues, not all of the carcinomatous particles can be reached by operation.

The prognosis depends on the age, position, and variety of the growth. There is a large percentage of cures in squamous cancers of the skin. With intelligent use there is no more danger attendant upon the use of the *x*-ray than in the employment of an active drug.

The radiations from radium, Morton says, are not especially different from those of the Crookes tube, and the curative effect upon cancer is undoubtedly similar. One advantage of radium is that it may be enclosed within a cellulose tube and easily introduced into the vagina or throat, and thus cancer in these localities may be more conveniently treated.

**Fibroid Tumors of the Uterus A NEW TYPE OF PAPILLARY ADENOMYOMA.** Wiener<sup>2</sup> describes an adenomyoma of the uterus, the surface of which was covered with papillomatous or wart-like outgrowths of fibrous tissue. The case resembled that of Pick in every way, and these are the only cases of their kind so far reported. Because the growth at first sight resembles a papillary carcinoma of the ovary, it is clinically worth while to bear in mind the existence of such adenomyomata. The tumor was larger than a man's head, showed several adhesions, and consisted of two main lobes, each of which was made up of several nodules. The surface of a large area of the tumor was covered by wart-like growths from 2 to 3 mm. to several centimetres high. The entire mass was attached to the fundus of the uterus by a

<sup>1</sup> International Journal of Surgery, October, 1903.

<sup>2</sup> Monat. f. Geburts. u. Gynäk., Bd. xvi., Heft 2.

pedicle 2 cm. broad and  $\frac{1}{2}$  cm. thick. Except that it was pedunculated it agreed with Pick's tumor in its gross appearance and in its general histological features. The microscopic examination showed a fibromyxomatous structure, with hyaline and fatty degeneration and oedematous infiltration in some parts, together with adenomatous formations in isolated areas under the periphery. These gland-like formations resembled those commonly found in adenomyomata. Pick's tumor was united by a hard base to the posterior surface of the uterus, and was associated with a malformation of the tube. In Wiener's case there was no abnormality of the uterus itself or of the adnexa. The papillary outgrowths, as in Pick's case, were not the secondary effects of peritoneal adhesions nor the results of an exudate. They were actual outgrowths of the fibromuscular tissue of the tumor, as was demonstrated by the microscope. Pick considered them to be evidences of an excessive energy of growth. Papillary outgrowths may be looked upon as peculiar to adenomyomata, for if they occurred in connection with ordinary fibromata many more cases should have been heretofore reported.

**AGE AND RACIAL CHARACTERISTICS IN FIBROID TUMORS.** Hunner<sup>1</sup> reviews 100 consecutive cases of myomata occurring at the Johns Hopkins Hospital. Of the 100 patients 31 were of the colored and 69 of the white race. This shows a greater frequency of the disease among the blacks, because the general average of colored women admitted to the gynecological wards compared to white women is as 1 to 5; 80 per cent. of the patients were between thirty and forty-nine years of age; of the women, 20 per cent. were not married. Of the 80 married women, 26, or 32 per cent., had never been pregnant, while of the 54 women who had been pregnant 11, or about 20 per cent., had borne but one child, and 6 had never carried a child to a viable age.

**SYMPTOMS OF FIBROID TUMORS.** Hunner<sup>2</sup> noticed the following symptoms with the indicated frequency:

Unusual loss of blood	{ increased menstrual flow, 41 per cent. intermenstrual hemorrhage, 15 "	56 per cent.
Pain in abdomen or pelvis, or dysmenorrhœa . . . . .	53	"
Abdominal tumor . . . . .	35	"
Urinary symptoms due to pressure on the bladder . . . . .	23	"
Bowel symptoms, e. g., unusual constipation, defecation pains, and pressure . . . . .	16	"
Gastric disorders . . . . .	6	"

The pain usually depends on some other factor than the size of the tumor; complicating inflammatory adnexal disease or adherent ovarian

<sup>1</sup> American Medicine, July 11, 1903.

<sup>2</sup> Loc. cit.

cysts are more apt to be productive of it than is the tumor itself. Very small subserous nodules undetected by palpation may give rise to serious dysmenorrhœa.

THE PATHOLOGICAL SIGNIFICANCE OF FIBROID TUMORS. Since Martin, in 1888, made a study of the degeneration of fibroid tumors there have been a number of writers who have endeavored to show that there are dangers inherent in the very presence of these growths. They believe this is true not alone because of the degenerations of the myoma itself, but also because of coincident complications.

Noble<sup>1</sup> in recent years has brought this subject forcibly before the profession. A full abstract of this paper was published in PROGRESSIVE MEDICINE for 1902. Since Noble's first paper, in which he showed the dangers which accompany fibroid tumors, and advocated on these grounds their early removal, a number of surgeons have systematically examined their records of fibroid tumor and tabulated the frequency with which they encountered degeneration or other associated complications. McDonald<sup>2</sup> has collected the literature upon this subject up to 1903, and, together with 280 cases of his own, has estimated the indications and contraindications to treatment of fibromyomata upon the pathological basis.

The *Journal of Obstetrics and Gynecology* of the British Empire published an abstract of a paper of Constantin<sup>3</sup> who has reviewed 208 cases of fibroid tumor of the uterus, 69 of which occurred in the clinic of Pozzi. The writer believes from these and other cases that alterations occur in the uterine appendages in 59 per cent. of cases of uterine fibroid.

Concerning the significance of such pathological findings Constantin comes to the following conclusions :

1. In a number of instances in which pathological changes in the appendages are found associated with uterine fibroids, there is no evidence of an infective process, and it seems probable that the changes are due to a "non-inflammatory" action of the fibroid tumors, circulatory disturbances, secondary action of pelvic varicocele, mechanical irritation of the peritoneum by the tumor, or the influence of a "neoplastic diathesis."
2. While some of the changes in the appendages precede the development of the uterine fibromata, the majority follow it. Sometimes symptoms produced by these pathological changes in the appendages disclose the presence of fibroid growths in the uterus.
3. The prognostic significance of alterations in the appendages

<sup>1</sup> British Gynecological Journal, 1901.

<sup>2</sup> Transactions of the Philadelphia Obstetrical Society, February 4, 1904.

<sup>3</sup> Rev. de gynécol. et de chirurg. abdom., January, February, March, and April, 1903.

associated with fibroids is that of each complication considered by itself.

4. Choice of operative procedure depends upon a variety of circumstances: the size of the tumor, its relations with the uterus, its connection with neighboring organs, the accidents which the condition might produce, and the age of the patient. Hunner<sup>1</sup> says that of his series of 100 cases 6 patients died. When one considers the average death-rate for all gynecological cases, including advanced carcinoma, these figures are both surprising and suggestive. In 5 of the 6 fatal cases there was serious inflammatory disease of the appendages.

He asserts that the record of suffering, sterility, miscarriage, extra-uterine pregnancy, hemorrhage, anæmia, malignant growth, infection, and death in this brief series of 100 cases forces him into a radical attitude toward myoma of the uterus. He does not advocate operating upon every myoma, but he does believe that as the seriousness of the affection becomes better recognized, and as the ability for doing conservative work increases, the indications for operation will expand until no good surgeon's record of 100 cases will show that six women have been sacrificed because they waited until it was forever too late.

What deductions, asks McDonald,<sup>2</sup> can be drawn from statistics such as he has compiled? What advice are we to give a patient suffering from fibroids? The operation for fibroid tumor in skilled hands is practically devoid of danger, except in the presence of degeneration of the tumor itself or some other pathological lesion of the uterus or its adnexa. These complications are usually the result or the associates of temporizing measures, and with delay in operation the liability to degenerations and complications is increased. There is one class of fibroids (small subserous or intramural tumors) that may cause few or no symptoms. McDonald believes that a temporizing policy is justifiable only in cases of this sort and when no complications exist. He concludes as follows:

1. All fibroids which are producing symptoms, and all fibroids except those up to 4 cm. in diameter (especially when subserous or intramural), should be removed, because the risk to the patient from operation is far less than that from the tumors themselves.

2. In view of the sarcomatous changes associated with the carcinoma and the complications of utérine fibromyoma, early removal is indicated when it is of sufficient size to produce symptoms. Small uncomplicated tumors do not require early treatment.

3. Thorough pathological examination should be made of all fibroids for evidence of malignancy. Particular study should be devoted to

<sup>1</sup> Loc. cit.

<sup>2</sup> Loc. cit.

those tumors which are necrotic, cystic, or both, as among these are found the largest proportion of malignant changes.

The foregoing scientific study of fibroid tumors, which has been carefully made by McDonald, Noble, Hunner, and others, brings up the question as to whether these researches have really been of any great clinical value other than to emphasize more definitely the various incidents in the life history of a fibroid tumor. I cannot but feel that as surgeons we would fall into error were we to consider the mere presence of a fibroid tumor an indication for a myomectomy or a hysteromyomectomy. While undoubtedly the vast majority of these cases that come to the surgeon requires operation, the conclusion should not be drawn that the cases which may be seen by the general practitioner require such a radical policy. Not infrequently in the course of a confinement a fibroid tumor of more or less size may be discovered which has never given rise to symptoms before, nor does it manifest any dangerous tendencies after labor. The mere fact that this tumor is discovered incidentally would certainly not be a satisfactory indication for its removal. After a careful study of all of these papers bearing upon the pathological examination of fibroid tumors, I do not feel as yet sufficiently convinced to make me change the clinical indications which I now observe in advising the removal of a tumor.

They are as follows:

1. Severe anæmia incident to uterine hemorrhage.
2. Pressure upon the rectum, bladder, or other surrounding organs.
3. Rapid growth of the tumor, even though there may be no attendant symptoms.
4. Increasing malodorous discharge suggestive of necrosis, suppuration of the tumor, or malignant changes.
5. An intense fear of the tumor, such as is occasionally seen in nervous women, who are constantly brooding over the fact that they have a tumor and are intensely apprehensive as to its course, fearing that it will suddenly give trouble or that it will become malignant. When the fears of the patient cannot be allayed it is then better to operate.

Certainly in all cases where the tumor is accidentally discovered it is wise to have the patient kept under observation so that in the event of any of the cardinal symptoms arising, which indicate operation, no time may be lost in the removal of the tumor.

THE INFLUENCE OF ANÆMIA UPON THE TIME AND VARIETY OF OPERATION. In Hunner's<sup>1</sup> experience anæmia is a serious complication, but recovery followed in all cases where this was a pronounced

<sup>1</sup> Loc. cit.

symptom. The haemoglobin was 46 per cent. or lower in 9 out of 100 cases; it was 33 per cent. in 3 cases, and but 22 per cent. in 1 case. One patient whose haemoglobin had fallen to 15 per cent. was sent to the seashore and given iron until her haemoglobin reached 46 per cent., when she was successfully relieved of her myoma.

John H. Girvin<sup>1</sup> reports 2 hysterectomies for fibroid tumor, associated with marked anaemia. He discusses especially the question of the advisability of subjecting such patients to a severe operation. Relative to this Deaver and Moore have said that for acute suppurative conditions or after acute or chronic hemorrhages, operation for relief of the condition may be done, no matter what the percentage of haemoglobin. They report cases where the estimation of haemoglobin had fallen to 10 and 20 per cent., and yet operation was successful. Kalteyer notes that clinical and experimental evidence tend to show that ether given as an anaesthetic produces certain well-defined functional and structural changes in the economy, particularly upon the red corpuscles, and that after ether anaesthesia there is a fall in corpuscular haemoglobin. Da Costa<sup>2</sup> has observed successful operations in 4 patients whose percentage of haemoglobin was under 30. One of these cases was a pan-hysterectomy upon a woman whose percentage of haemoglobin was 21.

Girvin<sup>3</sup> also discusses the advisability of immediate operative interference in those cases in which the fibroid tumor, by its very presence, tends to increasing hemorrhage and severe anaemia. His first case, at the time of admission to the hospital, had 36 per cent. of haemoglobin. After seven weeks' treatment it had gone up to 42. Then an operation of two hours' duration was followed by gradual rise of the haemoglobin to 46 in about eight weeks. During the preparatory medicinal treatment the patient menstruated, and, although resting in bed and under careful supervision, the haemoglobin reached its lowest point, 32 per cent. The second case had 40 per cent. of haemoglobin upon admission. She was immediately operated upon and made a perfect recovery. Two weeks after the operation her haemoglobin had gone up to 45 per cent. Girvin believes that if the condition of the heart is good, even though the haemoglobin is low, the results will be favorable.

In the discussion that followed the reading of this paper Shober<sup>4</sup> said that he thought operation should be performed at once. Noble<sup>5</sup> spoke of a case that he had previously reported, in which a preliminary curettage had been performed with the haemoglobin at 10 per cent. The patient was in a very serious condition directly afterward, but

<sup>1</sup> American Journal of Obstetrics, May, 1902.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

<sup>5</sup> Ibid.

when her haemoglobin had gone up to 50 per cent. a hysterectomy was performed without any untoward effects. Many of such cases, Noble says, do well, and in this regard they contrast, especially with carcinoma cases, in which there is an associated anaemia. But in a feeble patient, with the haemoglobin at 40 and a corresponding drop in the blood count, he would be inclined to temporize. Le Conte<sup>1</sup> mentioned a patient who had come to him with a percentage as low as 14. After a few weeks of appropriate treatment it rose to 26 per cent. He then operated. The operation was difficult, lasting nearly two hours, but after the first twenty-four hours she had an uneventful recovery. Baldy<sup>2</sup> believes that no amount of anaemia should delay an operation if it is demanded. Beyea<sup>3</sup> states that there is a distinct difference in anaemia. While the toxæmic anaemia of carcinoma is a frequent source of fatality, the anaemia from suppurative conditions, such as a staphylococcus or streptococcus toxæmia, is much less dangerous. Where excessive bleeding has occurred in myoma of the uterus it would be best first to curette and pack, and then, after sufficient recuperation of the patient, perform hysterectomy. When this is impossible operation should be immediately performed, as the added risk is not very great. Each case must be decided for itself according to the surgeon's experience, but the estimation of the haemoglobin and a blood count are factors which should be of influence one way or the other.

**OPERATIVE TREATMENT.** Cullen,<sup>4</sup> because of the sarcomatous degeneration of fibroid tumors and their comparatively frequent association with adenocarcinoma, believes that:

1. Whenever sarcoma or carcinoma may coexist with myoma, panhysterectomy is imperative—not amputation through the cervix.
2. Bisection of the uterus is contraindicated where there is the possibility of a malignant growth developing in or being associated with the myomatous uterus.
3. In every case of hysteromyomectomy it is advisable to have an assistant open the uterus on its removal, to determine if carcinoma of the body exists, and to determine whether the myoma has become sarcomatous. If malignancy is detected the cervix must be removed without delay. Cullen would never perform myomectomy in any case where the appendages are adherent. In one such case he made an artificial ostium for each tube, besides removing the tumor. An old infection, which still lurked in the tubes, extended to the uterine walls at the site of the myoma enucleation, and the patient died at the end of a

<sup>1</sup> American Journal of Obstetrics, May, 1902.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Journal of the American Medical Association, October 24, 1903.

month from sepsis. In some extreme cases, where the tumor is wedged into the pelvis, bisection must be performed, even though there is a probability that in doing this operation malignant tissue will be invaded.

Freund<sup>1</sup> usually performs supravaginal hysterectomy. Panhysterectomy is indicated only when there is obliteration of the vaginal cervix, deep burrowing of the tumor into the pelvic cellular tissue, or in case of malignant complications. He recommends saving the ovaries whenever possible, and with them as much of the uterus as possible, so that there may be a monthly flux. In bad inflammatory cases he has bisected the uterus, as advocated by Kelly. He prefers, however, a transverse incision. A catheter determines the position of the upper limit of the bladder. An incision is made just above the bladder and extended backward and to the sides until the uterus is cut entirely through. The fingers then gain access to Douglas' pouch below the body of the uterus. After using this method for six years the author considers it the safest in such cases. It helps very materially in bringing out the landmarks in badly complicated cases.

G. H. Noble<sup>2</sup> describes bisection of the tumor and the uterus, with partial enucleation of bisected tumor, in abdominal hysterectomy for large fibroid tumors in the body of the uterus. He says that by this method very large tumors, filling the pelvis and extending laterally above it to the walls of the abdomen, are removed with less difficulty than by the ordinary hysterectomy. After delivering the tumor through the abdominal incision the broad ligaments and cornu of the uterus are caught with morcellation forceps and traction made upward and outward. The bladder is now pushed off and the tumor bisected from above downward or from below upward, as is most convenient, the incision being carried through the uterine body as far as the cervix. The bleeding is insignificant, for the ovarian vessels are compressed by the morcellation forceps and the uterine vessels are controlled by the traction upon the uterus. After dividing the tumor down to its insertion in the uterus each half is partially enucleated and rolled out of its bed on either side of the incision. At this stage of the operation the two halves of the tumor lie on opposite sides of the incision, the flat cut surface looking downward, the convex enucleated surface looking upward. The uterus is now cut through laterally in the cervical region and the uterine arteries secured. The remainder of the pedicles consists of broad ligament alone; they are compressed with the angiotribe and tied with catgut. After cutting away the mass on either side the edges of the cervical stump are stitched together and

<sup>1</sup> Münchener med. Wochens., January 27, 1903.

<sup>2</sup> American Journal of Obstetrics, June, 1903.

covered with peritoneum from the bladder in the usual fashion. If panhysterectomy is to be performed, after partial enucleation of the tumor, as described above, the cervix is divided anteriorly and posteriorly into the vagina by means of sharp-pointed scissors. Excision is accomplished by grasping the vaginal portion of the cervix on one side with a small pair of morcellation forceps, making firm traction and cutting from below upward, first severing the cervix from the vagina, then cutting close to the uterus, avoiding the ureters and uterine arteries. Noble claims the following advantages for combined bisection of tumor and uterus with partial enucleation:

1. Speed.
2. Decreased loss of blood.
3. Larger working space.
4. Easy manipulation and safety against injury to the ureters and uterine arteries.

He has also described a method for dealing with intraligamentous and postperitoneal fibroid tumors in a deep pelvis. He approaches them by bisecting the uterus and penetrating their capsule by way of the endometrium. The tumor is then enucleated while the capsule may be sutured and left *in situ*. This protects against injury to the ureters and bloodvessels, and prevents the annoying oozing from many small vessels, as so often occurs after complete extirpation of these growths.

The foregoing modifications, to fit certain conditions met with during the removal of a fibroid tumor, meet with my hearty endorsement, for I am certain that the suggestions offered by Noble will be of the greatest value in some of these cases where it is extremely difficult to reach in the ordinary way the bloodvessels supplying the tumor. Every surgeon should have at his command not only the method which he ordinarily pursues, but also all of the accessory ways of reaching his end in the event of abnormal difficulties. The skill of the surgeon is not shown so much by deftly carrying out a well-tested plan as by substituting other plans when insuperable difficulties are encountered.

**Accidental Perforation of the Uterus.** As stated in the following article by Brothers, accidental perforation of the uterus in the course of curettage or other simple operative procedures upon the uterine cavity is very infrequently reported, and comparatively little attention has been given to the treatment of this accident. The simple perforation of the uterus with a sound or the curette, if there is no infection present, is usually attended by no serious results. If, however, the uterus is very soft and friable and considerable laceration takes place, the intestine may prolapse into the uterus or, as in one instance which came under my observation, a considerable proportion of the omentum not only escaped into the uterus, but projected from

the cervical canal into the vagina. I need make no personal comment upon the treatment, for Brothers has fully voiced my opinion upon this matter.

Brothers<sup>1</sup> believes that perforations of the uterus are more frequent than is customarily supposed. While such cases are generally supposed to occur in the hands of midwives, professional abortionists, and ignorant persons, according to Brothers a large majority of these accidents are actually connected with legitimate work in the hands of honest practitioners, and are not reported on account of the fear of criminal prosecution or at least of public condemnation. The subject of accidental perforation of the uterus should be thoroughly discussed, for this will tend to prevent its occurrence and define the proper management of such cases.

The diagnosis of accidental perforation is not always easy. A sound, it seems, may occasionally pass well into the Fallopian tube, or even traverse the tube and enter the peritoneal cavity, thus giving the impression of a perforation. Kossman says that Biedert has proved by experiments that the sound can be passed into the tube. In one instance Gönners, finding that a sound entered 6 cm. deep for a distance of 13 to 14 cm., did a colpotomy, but found no evidence of injury. Beuttner and Kossman believe that the uterus, puerperal or non-puerperal, may undergo, during the passage of instruments, a sudden paralysis of the muscular coat and become converted into a relaxed bag, which may be very much stretched or elongated by the curette or sound. Although these explanations may obtain occasionally, the large proportion of cases where, during curettage or intra-uterine sounding, the instrument slips away or passes to an unusual depth are actual perforations. Such cases have been reported by Tait, Haynes, Wertheim, Odebrecht, Pozzi, v. Guerard, Alberti, Mann, and others. Abrams reports 4 cases which he has seen in consultation, and 4 cases in which he himself was responsible for the perforation. Altogether the author has collected 66 cases, of which 49 ended in recovery and 17 were fatal. There is difficulty in judging the mortality rate, he thinks, from these figures, because there must be a large number of instances where, the patient recovering, the accident is not reported. In considering the proper course to pursue in the management of perforations of the uterus he makes three classifications:

1. Perforation of the uterus during the passage of a sound or of a curette. Such an accident is usually recognized by the penetration of the instrument to a depth greater than the size of the uterus, previously determined by bimanual examination. Although this is sometimes to

<sup>1</sup> American Gynecology, April, 1903.

be explained by a patulous Fallopian tube, it is much better to regard it as a perforation. If the abdomen is to be opened for other purposes, the uterus may be examined at that time and the perforation closed. Otherwise intra-uterine manipulation should be immediately suspended ; no irrigation of the uterine cavity should be permitted ; the patient should be put to bed, an ice-cap placed over the hypogastrium, and opiates administered. Drainage is not required.

2. Perforation of the uterus followed by irrigation of the interior. In the event of such a complication there are three possibilities : a mild local peritonitis may demand no more than the treatment already outlined ; an acute septic peritonitis may be the indication for an immediate hysterectomy (preferably vaginal), with drainage through the vagina. A peritonitis less virulent, but chronic, which frequently results in localized abscesses in the pelvic connective tissue or in the pelvic peritoneum, may also be a sequel to the accident. The treatment depends upon the situation of these abscesses ; very rarely is a hysterectomy necessary.

3. Perforation of the uterus with prolapsus and strangulation of the intestine in the wound. Here laparotomy must be performed as early as possible ; if necessary the injured intestine should be resected. Whether the uterus is to be removed or not will depend upon the judgment of the operator in the individual case. Miquel reports operation upon 8 cases, with 5 recoveries.

**Displacements of the Uterus.** Pfannenstiel<sup>1</sup> believes that in the treatment of anomalies in the position of the uterus too much significance is given to the malposition in itself. In his opinion the pain or suffering accompanying a retroversion of the uterus is due usually to the complications, which may be either local or general.

The uncomplicated retroversion causes no local suffering, and therefore requires no local treatment. He also calls attention to the fallacy of the use of a pessary in the treatment of congenital retropositions of the uterus. In such cases the malposition of the uterus is not alone to be considered, for in addition there is usually an anomalous state of the entire pelvic contents. The vagina is too short, especially the anterior wall ; the vaginal vault is quite flat, while the parametrium and the broad and ovarian ligaments are too short. The entire genital tract may be infantile. The local symptoms, dysmenorrhœa and sterility, may require treatment in these patients, but not by means of the pessary, which is incapable of good, and often causes further harm by its presence.

Independent of this congenital form of retroversion there is the

<sup>1</sup> Monats. f. Geb. u. Gyn., Bd. xviii., Heft 11.

usual one which may be accompanied by all sorts of symptoms, both local and general. The more these cases are carefully analyzed, the more the conclusion is reached that the symptoms depend not so much upon the malposition itself as upon the coincident complications. These may include subinvolution of the uterus, chronic metritis and endometritis, laceration of the cervix with or without ectropion, scars in the parametrium, adnexal affections, and chronic pelvic peritonitis. When a pessary does good in such cases it has this virtue not *per se* by reason of its restoring the uterus to its normal position, but because of the fact that, with the uterus in its place, the complications are more amenable to treatment.

There are two complications of retroversion of the uterus that require special consideration : pelvic peritonitis and descensus vaginalæ. The first is usually spoken of as "retroflexio uteri fixati"; the latter is commonly underestimated in its importance. The former originates, as a rule, from a widespread pelvic peritonitis secondary to some adnexal inflammation. These cases complain of severe pain from the peritonitis, and not from the malposition of the uterus. This is evidenced by several facts : first, there is similar pain in pelvic peritonitis unassociated with retroversion; second, after pelvic peritonitis has run its course in older women the uterus may remain permanently retroverted and adherent without giving rise to suffering. The treatment of retroversion with pelvic peritonitis should, in Pfannenstiel's opinion, consist in replacing the uterus if the adhesions are light, the use of hot douches, and sitz baths. In chronic cases, massage and gradual replacement of the womb by drawing on the adhesions from time to time. He does not believe in Schultz's method of forcibly breaking up the adhesions under ether. If the palliative measures fail, then operation should be employed; either ventrofixation or vaginofixation following release of the uterus and the proper disposal of the appendages. Even in such cases the condition of the uterus *per se* is of no moment. It is held forward, however, to prevent readhesion and to influence favorably the course of the inflammation.

In the second group of cases, those associated with descensus vaginalæ, the latter malposition gives origin to the symptoms, and it is chiefly in these cases that the pessary is of value. This applies more to women who are not obliged to support themselves. In the working classes operation is more advisable. Wormser<sup>1</sup> concludes that uncomplicated retroversion in the majority of perfectly healthy women gives rise to no symptoms and requires no treatment, except during preg-

<sup>1</sup> Referate, Zentralbl. f. Gyn., 1903, No. 30.

nancy. The pain which women with movable retroversion complain of is due to one of two causes : either it depends upon local complications, which are often not easily recognizable, or it results from a disturbance of the nervous system. In both instances the position of the uterus in itself is not the cause of the suffering. The treatment, therefore, should be directed first against the complications and the nervous state. Only when this fails should the position of the uterus be corrected.

Most of the discussions upon retroversion concern themselves alone with the pros and cons or the choice of operation. The broader and more valuable inquiries into the question of retroversion include the treatment of all cases, whether they are suitable for palliation or for operative treatment. The subject is well handled by Dunning,<sup>1</sup> who has studied 112 cases of retroversion treated by himself, and draws the following conclusions :

1. Simple uncomplicated retroversion of the uterus gives rise to but few symptoms, the chief of which are backache and bearing down pain. Painful menstruation occurred in 37 per cent. of the cases. Uncomplicated cases constituted but 7.01 per cent. of the entire number under observation (112). Five uncomplicated cases were treated by the non-operative plan ; 3 were cured and 2 were greatly relieved.

2. The severity of the symptoms and the prospect of cure depend largely on the number and character of the complications. Prolapsed and chronically inflamed ovaries, endometritis, and laceration of the cervix uteri constitute the most common and serious complications.

The most common symptom is pain, occurring in 74 per cent. of cases. This includes painful menstruation, 36 per cent. ; backache, 35 per cent. In but 21 per cent. of the cases was there habitual constipation. Various degrees of invalidism existed in all complicated cases.

3. In the treatment of the simpler and less complicated cases the non-operative method yields satisfactory results. Recent cases, especially those following labor, improved rapidly under this form of treatment.

4. Displacements of long duration accompanied by the more serious complications are not cured by this method, and the benefits resulting are scarcely sufficient to justify the effort.

5. Operative methods in the severest forms of displacement and complication are attended by a large percentage of cures, and should be employed in preference to all other means. So large a percentage of these cases have multiple complications that two or more operations may occur in each case.

<sup>1</sup> Journal of the American Medical Association, November 14, 1903.

6. The danger attending the operative method of treatment is very small. In the 21 cases reported there was no mortality.

By non-operative treatment. Dunning means the use of a suitable posture, tampons, pessary, topical applications, and internal medicine. In a few of the cases the uterus was curetted on account of an associated endometritis, and in several cases local applications to the endometrium were made. The author believes that the internal medicines were of more than incidental value in bringing about cure or relief. Cascara and rhubarb were employed as laxatives in chronic constipation, while in pelvic congestion salines were preferred. Gastric disorders were treated by hydrochloric acid and nux vomica and the careful regulation of the diet. In suitable cases bitter tonics were prescribed. The knee-chest position, tampons, hot douches, rest in bed, general massage, all were used in appropriate instances with good results.

Young<sup>1</sup> believes that retroversion and retroflexion should never be looked upon simply as a malposition of the fundus uteri; they are rather complex changes in the relation of the whole uterus to the other structures in the pelvis and to the pelvic wall. The uterosacral ligaments are the only suspensory ligaments of the uterus when the patient stands, and are the only ligaments not affected by gestation or parturition. Non-operative treatment of retroversion is applicable to acute traumatic and replaceable non-complicated cases. It depends for its value upon the relief of pelvic engorgement, the restoration of the normal circulation, and the return of the normal elasticity and tone to the ligaments and muscles.

He considers ventrosuspension a satisfactory operation, for its subsequent dangers are few and it is easily performed. The best operation he believes is sacrosuspension—Bissel's operation. In fat subjects, where time is a factor and where many adhesions have been broken up, ventrosuspension is preferable. After operation upon nulliparæ a pessary should be worn for six months, until the uterosacral ligaments have regained their tone. The various operations for retroversion of the uterus were freely discussed in last year's PROGRESSIVE MEDICINE. This year several new operations have been reported.

G. H. Noble<sup>2</sup> shortens the round ligament by intramural extraperitoneal anchorage. After a transverse suprapubic incision, which runs to the outer border of each rectus muscle, and includes skin, fat, and fascia, the recti are separated vertically and the peritoneum opened in the same direction. After making taut the ligament on one side, the finger, by the aid of forceps, is thrust through the posterior sheath of the rectus on that side into the preperitoneal fat. The ligament is

<sup>1</sup> Medical Record, New York, October 24.

<sup>2</sup> American Journal of Obstetrics, February, 1903.

grasped before it enters the internal ring extraperitoneally and drawn out into the incision. Its investments are stripped off and returned, and the loop of the ligament is anchored in the incision by means of a haemostat until the ligament of the opposite side is caught in a similar fashion. After closing the central peritoneal incision and uniting the fascia of the linea alba in a similar manner, the opening through the posterior sheath of the rectus and transverse incision through the fascia on each side is closed by a continuous catgut suture, which includes a portion of the round ligament at each turn. If the ligaments are long enough they may be joined together in the median line over the recti, but beneath their anterior sheath. Noble has performed this operation 67 times ; 23 cases occurred in his private practice, all of which he has been able to follow. The results have been very gratifying. He claims the following advantages for this operation :

1. There is but one incision ; through it any pelvic complication may be treated.
2. The weak distal end of the ligament is not depended upon for support, as in the operation of Alexander, Wylie, Mann, and others ; the part utilized is the stronger uterine end.
3. It does not interfere with the normal mobility of the uterus or its physiological development during pregnancy.
4. The fixation is extraperitoneal ; there are no points of irritation that invite adhesion to the abdominal viscera.
5. The operation does not predispose to hernia, not infrequent after the Alexander operation ; the round ligament does not pull open the internal ring by constant strain on its inner border.
6. There is no encroachment on the bladder nor interference with its distention.

The danger of the operation, according to Noble, is about on a par with exploratory laparotomy. Noble's operation appeals to one for several reasons. First, because it has been employed in 67 cases with no bad result. There would seem certainly to be no loss of integrity in the abdominal parietes, and there should be no complicating sequelæ. The strongest part of the round ligament is used for support, and there is no traction on the internal ring. This latter must be taken into account in shortening the round ligaments in the inguinal canal. During the past year I have found upon the cadaver that any strain upon the round ligaments anchored in the inguinal canal produces considerable enlargement of the internal ring. Furthermore, Noble's operation allows the same freedom of operative procedure in connection with supporting the uterus as do any of the intra-abdominal operations. In uncomplicated cases, however, the opening into the general abdominal cavity need be no more than that required for exploratory section.

**An Explanation for So-called Essential Metrorrhagia.** In view of the fact that a very profuse menstrual discharge or a hemorrhagic flow in the interval between the periods may be the indication of the early beginning of a malignant process, the student as well as the physician is likely to get an exaggerated fear of this symptom, and is thus inclined to overlook some of the simpler conditions which give rise to it. It should always be a principle, however, to consider these unusual hemorrhagic symptoms as indicative of some serious lesion rather than to pass them over lightly in the thought that they are simple functional disturbances, due to climacteric or other local or constitutional changes. So far as the establishment of a diagnosis is concerned, therefore, it is always the safer plan to eliminate first the malignant changes, if need be, by a thorough curettage and microscopic investigation. If this proves negative, then the case should be carefully studied with a view of determining the cause of the unusual flow.

Theilhaber and Meier<sup>1</sup> assert that a goodly proportion of women who consult the gynecologist complain of menorrhagia, metrorrhagia, or leucorrhœa. The average physician in the absence of self-evident causes for these symptoms, viz., myomata, malignant disease, gonorrhœa, adnexal affections, or malposition of the uterus, is content to attribute the condition to an affection of the endometrium. This interpretation is often incorrect; at least, the endometrial disease, when it exists, is often secondary or entirely trivial compared to the real cause, which consists of pathological changes in the musculature of the uterus—the myometrium. The authors believe that the uterus is the seat of periodical muscular contractions, which are more pronounced during the period of sexual activity, and especially during menstruation and childbirth. It seems unquestionable that the uterine contractions play an important part in preserving the normal pelvic circulation.

The development of the vascular system of the uterus goes hand-in-hand with the development of its musculature. Thus, in the child scarcely one-third of the myometrium actually consists of muscle, while the vessels are thin and weak. As puberty approaches, and until the age of twenty, the vessels grow larger and the proportion of musculature is increased to about two-thirds of the entire myometrium, and during pregnancy there is a massive increase. After parturition the uterus undergoes involution, but this affects principally the muscular tissue, so that after each pregnancy the proportion of connective tissue in the mesometrium is increased. As the time for the menopause approaches the muscular elements especially undergo atrophy, and this atrophy continues for some time after menstruation has ceased. The

<sup>1</sup> Archiv f. Gynäk., Bd. lxvi., Heft 1.

bloodvessels at this time (sixty years), as far as their capacity is concerned, are about equal to the bloodvessels in the child's uterus. They, of course, are larger, but by reason of an increasing thickness in their walls (*arteritis obliterans*), their calibre is considerably reduced. It is natural to suppose that the musculature of the uterus should be in direct proportion to the development of the uterine vessels, for if a disturbance of this proportion arises, in view of the numerous menstrual congestions, the blood will not be properly driven out of the venous channels of the uterus, and passive congestion will occur. This condition produces the symptoms under discussion, and may be styled *insufficientia uteri*. Theilhaber has found *insufficientia uteri* under several phases :

1. It not infrequently happens that shortly after puberty a girl suffers from menorrhagia, perhaps metrorrhagia, either with or without leucorrhœa. An examination usually shows the uterus small and undeveloped; but, if the condition has persisted for some time, the uterus may be enlarged. All of the symptoms are often attributed to a hyperplastic endometrium, endometritis, or metritis. Theilhaber believes that, in view of the improbability of infection in these cases, these symptoms are due to an undevelopment of the muscular elements, plus an overdevelopment of the bloodvessels of the myometrium. He would therefore designate these cases, which are sometimes, in the absence of definite pathological alterations, called *essential hemorrhage*, as hemorrhage due to a hypoplasia of the musculature of the uterus. The cause of this affection he believes is due to an unnatural early congestion of the pelvic organs, produced by onanism, luxurious life, richly seasoned food, and certain beverages, as alcohol, coffee, and tea. It has been shown by Weber that children raised under luxurious surroundings menstruate earlier than those of the peasant class, who are exposed to hard work and outdoor life, and who eat plain food.

2. A second form of insufficiency of the uterine muscle is caused by degeneration of the uterine musculature. Very often in young and chlorotic girls there appears a marked leucorrhœa. Upon examination the uterus is found small and relaxed. In this class of cases there is no bleeding during the chlorotic state on account of the weak circulation. The pathological changes in the uterine muscle is comparable to the disturbance of the heart muscle itself in this condition. After the blood has returned to the normal in chlorosis there may be menorrhagia for a considerable length of time, until the uterine musculature has recovered its tone.

3. The uterine bleeding, which occurs at the onset of acute infectious diseases, as typhus, variola, and influenza, are explained in several ways

a. *Endometritis hæmorrhagica* (*Slavianski*).

b. Inflammatory and degenerative processes in the mesometrium from the action of toxins.

c. Theilhaber thinks the most frequent etiological factor is the suddenly increased blood pressure, which may cause uterine as well as nasal hemorrhage.

The hemorrhage which follows these affections may be ascribed to a degeneration of the uterine muscle. Perhaps the most frequent source of *insufficientia uteri* is found in myofibromata of the uterus. The child-bearing period in woman ceases long before the advent of the menopause, and this is attributable to the regressive changes that occur in the ovary. Similar regressive changes are found in the uterine musculature some years before the menopause. This phenomenon is analogous to the senile atrophy which occurs in the general musculature of the body. As the internal genitalia cease to functionate after the menopause, it naturally follows that the regressive muscular changes here should at once appear. As a rule, at the time when these muscular changes occur, the circulation of the pelvis is slow and the calibre of the bloodvessels becomes narrowed by a thickening of the vessel walls. If, however, in consequence of frequent psychical excitation, irritating food and drink, and excessive sexual activity, the usual diminution in the rate of the pelvic circulation does not occur, the obliterating process in the vessels is interrupted; therefore, venous stasis and hemorrhage result. It is also true that preclimacteric metrorrhagia is hereditary. Here the author believes the underlying condition is the unusually early atrophy of the uterine musculature.

4. Severe acute and subacute affections of the adnexa and pelvic peritoneum may cause *insufficientia uteri*. Such processes cause an oedematous condition of the uterus. The organ appears thicker, broader, softer, and less contractile.

5. Insufficiency of the uterine muscle is quite often the cause of the hemorrhages in cases of *myoma uteri*. It is easy to see how, in such cases, even though the muscular elements are hyperplastic, they would be unable to properly contract on account of the mechanical hindrance offered by the foreign body.

6. *Subinvolutio uteri* may produce *insufficientia uteri*.

Under the direction of Theilhaber, Meier has examined most carefully 61 uteri, with regard to the changes in the construction of the mesometrium, including its bloodvessels, connective tissue, and muscular elements. The uteri represented all periods of women's life, and all of the pathological conditions above mentioned were found. Theilhaber divides the entire class of cases embraced by the term "chronic metroendometritis" into two divisions:

A. Primary endometritis with or without secondary mesometritis.

The chronic endometritis is nearly always produced by infection (gonorrhœa, puerperal fever, and infrequently tuberculosis). Usually associated with the chronic endometritis there is a more or less well-defined secondary alteration in the mesometrium.

B. Primary disturbance of the mesometrium. Under this head he reckons hypoplasia uteri virginalis, myofibrosis uteri, and the other conditions as previously considered in this paper.

### PELVIC INFECTION.

**Diagnosis and Treatment of Pelvic Infection.** Statistics quoted from time to time appear at one time to indicate that palliation, at another that radical extirpation afford the best chance for cure of suppurative diseases of the appendages. Two years ago in PROGRESSIVE MEDICINE we reported the favorable results obtained from the use of hot sandbags in the palliative treatment. While this plan may be suitable for women of leisure, it is in a large proportion of cases inapplicable, because of the time which it requires to effect relief. My own opinion is in accord with the general surgical judgment, which favors operation. Beyond this, however, there are many disputed points. Whether the operation shall be made through the vagina or through an abdominal incision; whether diseased parts shall be removed or simply drained; how far the surgeon may go with safety in the conservation of but moderately diseased structures; what the results of conservatism in purulent cases are—are all questions of great clinical pertinency. The answer does not lie in any rule. The choice of treatment, although it should be modified by well-defined rules, must be suited to each individual. It would appear from the literature that the danger from suppurative diseases of the appendages varies in different parts of the same country. Thus Jung<sup>1</sup> reports observations upon 134 cases of pelvic abscess. They were treated at the Greifswald Clinic between April, 1899, and December, 1902. Operation was performed in 117 cases, and 17 were treated palliatively. The first group gave a mortality of 20.5 per cent.; of these, 101 were cases of intraperitoneal and 16 of extraperitoneal suppuration. The variety of operation and the mortality in the series may be summarized as follows: 39 laparotomies, with 13 deaths; 43 colpotomies, with 5 deaths; 9 vaginal total extirpations, with 4 deaths; 9 vaginal incisions, with no deaths; 1 vaginal puncture, with 1 death.

The high mortality attending these cases is explained by the bacteriological examinations. In 81 cases (35 per cent.) there were strepto-

<sup>1</sup> Zentralbl. f. Gyn. 1903, No. 37.

cocci or staphylococci; in 24 per cent. there were gonococci; in 14 per cent. tubercle bacilli were found. These findings are quite opposite to those from clinics in large cities, where similar investigations have proved the pus to be sterile in more than half the cases, while the great majority of others were attributed to the gonococcus. It appears that the infection in Jung's cases are to be attributed to faulty midwifery. The frequency of tuberculous infection is unexplainable. The great danger from pyogenic and tuberculous infection must be accepted as a reason for the bad operative results. A further analysis of Jung's cases shows that not less than 10 of the deaths followed streptococcal infection, and 92 per cent. of the fatal results occurred in cases in which the peritoneal cavity was freely opened during operation. Because of these facts Martin is inclined to employ incision and drainage in the Greifswald cases. The complete cure of patients subjected to this form of treatment is promoted by the use after operation of Klapp's heat apparatus. (In last year's PROGRESSIVE MEDICINE we described a similar apparatus—that of Polano—and reported the treatment in detail.) In 9 of Martin's cases treated in this manner radical operation was finally required. From his own material Jung cannot agree with the statement that the tubal pus is sterile after a certain time (three-quarters to one year) has passed. In but 18.5 per cent. of cases was the pus sterile. Of the positive cases, in more than 12 (2 fatal) the original infection had occurred more than a year previous (one fourteen years); 8 of these were streptococcal. Kiefer's theory concerning the death of bacteria in closed sacs does not seem to obtain, therefore, in the cases of streptococcus infection. Last year we drew attention to the fact that Schatz and von Rosthorn explained Jung's previous bacteriological findings upon the prevalence of streptococcal sore throat in areas of country bordering on large water-ways.

In closing his article Jung describes the autopsy findings in 8 cases in which small fistulous communications existed between the rectum and a left tubal abscess; these communications were overlooked both before and during the operation, and Jung believes their recognition during the operation was impossible. Among 24 fatal cases, in 8 (33½ per cent.) there were long-standing rectal communications. Such a complication is only found in the severest cases, but always renders the contents of the abscess extraordinarily dangerous. If there is no purulent discharge from the rectum the only way of making a diagnosis before operation is by rectal palpation, although in Jung's experience this has always been negative. In order to detect these minute rectal communications, the author recommends an injection of salt solution into the rectum under slight pressure during the operation. The surrounding parts must, of course, be well protected by gauze. The

unfavorable results in the badly complicated cases teach us to avoid the radical operation when possible and be content with the simple evacuation of the pus and drainage of the sac.

In reviewing the foregoing article three very interesting facts are noted: the remarkable constancy of positive bacteriological findings in the pus from pelvic abscesses, the high mortality following operation, and the advice of the writer to avoid the danger by simple evacuation of the abscess. From a large number of bacteriological investigations from various sources, it has been established as a working rule that in pelvic infection, by the time an abscess is well established, its contents become more or less innocuous as the result of the death of the primary infecting organism. From the above study it would seem that this rule may have to be modified. Until, however, further investigations are made in other clinics to confirm these results, the old rule should stand, for faulty technique might have to be taken into account to explain the remarkable difference between Jung's results and those reported by other writers. One point, however, which is especially of practical import relates to the lessened mortality following the evacuation of the pus, either through abdominal or vaginal incision, as compared with the attempts at total extirpation. Howard Kelly was the first to point out the value of vaginal puncture in dense pelvic abscesses, and in his first series of cases demonstrated beyond question that this is a more effective life-saving measure when compared with the more radical operations. While it may be necessary subsequently to perform a more extensive operation, through the simpler procedure the patient sufficiently recovers from the primary infection to make her much more resistant to the second operation. We are, therefore, unqualifiedly in favor of Jung's position, relative to the simple evacuation of pelvic abscesses, as compared with the radical ablation of the abscess sacs.

**LEUKOCYTOSIS IN PELVIC SUPPURATION.** Dutzmann's observations on leukocytosis in pelvic suppuration have been the most thorough of which we know. Martin<sup>1</sup> claims that in diseases of the female genitalia, complicated by suppuration, there is frequently very little indication, either from the history or the examination before operation, of the nature of the infection, and whether the pus is sterile or infectious.

In an endeavor to find some means of settling these questions which would determine the operative procedure and especially the advisability of drainage, Martin has had carried out in his clinic careful investigations which were based upon the observations of Curschmann relative to leukocytosis. He refers to the work of Jung and Dutzmann, and agrees with the latter in his conclusion that the determination of the

<sup>1</sup> Zentralbl. f. Gyn., 1903, No. 49.

leukocytes in suppurative diseases of the genitalia, while not a decisive means of diagnosis, is in every case a considerable aid. Upon the basis of these investigations in Martin's clinic, in all diseases of the genitalia an estimation of the leukocytes is made. Upon the result of this examination and upon the course of the operation the use of drainage depends. When there occurs during enucleation no soiling of the peritoneum with pus there is no necessity for drainage. In vaginal extirpation, when the adhesions in the pelvis are broad and the pus has invaded the pelvic connective tissue, rubber and, finally, gauze drainage is employed. In his coeliotomy cases drainage is only employed where there is an acute operative leukocytosis. If complicated by fistulous communications with the bowel, which are not directly accessible, gauze drainage is employed from above and from below. Parenchymatous bleeding from large surfaces is an indication for drainage. When possible, drainage is preferable through the vagina. According to these precepts Martin, in the last one and one-half years, operated upon 28 cases : 5 laparotomies, with 2 deaths ; 23 colpotomies, with 1 death. One death in the series of 5 laparotomies occurred from fulminating streptococcal peritonitis ; 1 resulted from the perforation of a tuberculous ulcer of the rectum that had not been noticed during operation. In 2 of these cases vaginal drainage was employed ; 3 cases were drained through the lower angle of the abdominal incision. In the 23 vaginal cases 12 were radical operations, and there were no deaths ; in 11 cases the pus was evacuated and complete cure accomplished by way of the vagina.

The latest observations of Dutzmann<sup>1</sup> may well be included at this time. His conclusions are as follows :

1. The determination of leukocytosis is an important diagnostic factor when there is a pelvic exudate, and indicates the occurrence of suppuration.
2. In doubtful cases the iodine reaction of the white blood corpuscles may be taken as a further indication of the presence of pus.
3. In adnexal disease of whatever nature estimation of the leukocytes is useful in differential diagnosis.
4. In myoma, carcinoma, and tubal pregnancy leukocytosis is frequently the only indication of suppuration.
5. Tuberculous suppuration produces no increase in the number of leukocytes ; gonorrhœal suppuration is attended by a slight increase. This is to be attributed to the greater toleration and lesser absorptive power of the peritoneum for these bacteria and their toxins.
6. In large ovarian tumors, especially in those with twisted pedicles,

<sup>1</sup> Monats. f. Geburts. und. Gynäk., Band xviii. Heft 1.

or associated with peritoneal irritation, a pronounced leukocytosis occurs, even in the absence of pus. In these cases the iodine reaction is negative.

7. In septicæmia the estimation of leukocytes is valuable from a prognostic standpoint; thus a pronounced leukocytosis is a favorable while a diminution in their number is an unfavorable sign. This fact may afford an indication as to the proper time for operative interference in puerperal fever.

8. In eclampsia the leukocytes behave as they do in sepsis. When there is a hyperleukocytosis there are fewer convulsive attacks and the outlook is favorable; when the number of leukocytes is normal or subnormal the contrary is true. These facts are arguments in favor of the theory that eclampsia is due to an infection.

That there are other views concerning leukocytosis is evident from the work of Kirchmayr.<sup>1</sup> In a series of his cases, in which there was pelvic suppuration, there was a considerable increase in the leukocytes. In 8 other cases, however, in spite of a similar pathological condition, the highest leukocyte count was only 17,190, and in 2 cases there was only a slight leukocytosis. In several cases, in which there was no pus at the operation, the leukocytes quickly rose to twice their previous number after its performance. The author attributes this to the opening up of the lymph channels. In a few cases, in which suppuration was excluded, there was a marked leukocytosis up to 26,000. The author concludes that while a leukocytosis of about 30,000 is a very trustworthy evidence of suppuration, it should nevertheless not have the chief weight in a decisive diagnosis. A moderate increase of the leukocytes is neither an evidence for nor against suppuration, and a normal leukocytic count does not certainly exclude the existence of pus. (The author has evidently no knowledge of the observations of White, Lerber, Schultz, or Chadbourne upon postoperative leukocytosis.)

I have quoted the foregoing article rather extensively, and propose to criticise rather than to coincide with the general conclusions relative to drainage, and also as to the value of the leukocyte count in a clinical determination of whether there is pus in the pelvis. The mere evacuation of pus into the peritoneal cavity is by no means considered in general, in America, an indication for the introduction of drainage, provided the pus sac is cleanly enucleated. In view of the fact that the majority of observers, in opposition<sup>2</sup> to the results obtained in Martin's clinic, have claimed that the pus in the larger number of pelvic abscesses is sterile, I am, as indicated in a preceding page,

<sup>1</sup> Zentralbl. f. Gyn., 1903, No. 49.

inclined to look with some skepticism upon the comparatively large number of cases in which positive bacteriological findings have been made. My own rule, therefore, relative to drainage, as stated in several articles, is "When in doubt, do not drain." As to the value of a leukocytosis in deciding whether pus is present, I am likewise very skeptical. There are too many possibilities of mistakes in these cases. The value of such examinations depends, first, upon the skill of the observer, and second, upon the repetition of the examinations. My opinion is that a leukocyte count is of absolutely no value unless it is repeatedly made at short intervals, and even then the clinical evidences are of very much more value in reaching a decision to operate. If pelvic suppuration is without clinical symptoms sufficiently evident to establish its existence, certainly even a positive leukocyte count should never be a decisive factor in the decision to operate. While, therefore, I quote all of Dutzmann's conclusions, I am in accord with very few of them.

**Conservative Surgery in Gynecological Cases.** Two years ago in PROGRESSIVE MEDICINE I reviewed an article by Beyea on the conservation of the ovaries, tubes, and as much of the uterus as possible in operations for fibroid tumors that were not amenable to myomectomy. At the time Beyea's paper was presented he had been unable to find in the literature any record of ovarian degeneration following hysterectomy for fibroid tumor in which the ovaries were left behind. Last year we abstracted a paper of Olshausen, who reported cystic degeneration in four cases where the ovaries had been allowed to remain after hysteromyomectomy. This he attributed to an interference with their blood supply. Conservative surgery with regard to the choice and technique of operation in myoma uteri was discussed fully last year. We are more especially concerned now in the treatment of various chronic affections of the tubes and ovaries. R. C. Norris<sup>1</sup> gives his reasons for conservative surgery of the uterine appendages as follows:

1. The possible preservation of the procreative function.
2. The retention of the menstrual function.

He speaks of the importance of the first reason to the family, to the individual, and to the State, and believes that it is intimately connected with the perpetuation of domestic happiness in many instances.

Besides the direct relation between the preservation of the ovaries and the preservation of menstruation, these organs have other functions. Like other ductless glands they probably have a secretion which in an unknown manner helps to maintain nervous equilibrium, and in this function they are analogous to the thyroid glands and adrenals. The

<sup>1</sup> American Journal of Obstetrics, October, 1903.

nervous symptoms following castration in women are cited by the author as a proof of their functional part. He discusses the indications and limitations of conservative surgery under the following heads :

**A. SUPPURATIVE DISEASES OF THE APPENDAGES.** The risk of life in such cases is so great that conservatism is justifiable only in exceptional instances. If the infection is an old one (and especially if it is of gonorrhœal origin), if there has been an absence of recurrent attacks of pelvic peritonitis for a long period and other indications of a subsidence of active infection are present, if one side alone is to be saved, and that is only slightly involved, and, finally, if there are urgent reasons or strong desire for offspring, then the risk is justifiable with the patient's knowledge of the danger and the probable necessity for a second operation.

**B. OVARY ADHERENT TO PAROVARIAN CYST.** In three cases, in which the ovary was otherwise healthy, Norris has left it behind. The result in all three cases was most gratifying.

**C. PROLAPSE OF OVARY.** This organ should never be sacrificed simply because it is prolapsed. If healthy it may be stitched to the posterior surface of the broad ligament at a proper level, or the infundibulo-pelvic ligament may be shortened. This will relieve the distressing symptoms.

**D. THE EVACUATION OF PELVIC HÆMATOCELE DUE TO ECTOPIC PREGNANCY** by vaginal section has been advocated as a means of conserving the adnexæ of the affected side. Unless the collection of blood is an old one the dangers of immediate hemorrhage and the probability of infection are too great.

**E.** Prompt incision of the vaginal vault and extensive gauze packing to limit the spread of *puerperal infection*, as recommended by Henrotin and Pryor, is a plan of treatment that has limitations, but is conservative in its aim.

**F.** The most important field of conservative surgery upon the pelvic organs is found in the chronic cases where there are structural changes in the tubes and ovaries of greater or less extent—hydro- and hæmatosalpinx, ovarian hæmatoma, small, single, or multiple cysts of the ovary, and varying degrees of visceral adhesions. As a rule, in cases where conservatism must be considered the adnexæ on one side are irreparably diseased, while on the other conservatism offers possible relief.

These conservative measures include puncture and drainage of a small hydrosalpinx; dilatation of an occluded tube; incision into an occluded tube at its fimbriated end and an effort to maintain a patent opening by uniting the mucosa to the peritoneal surface; ignipuncture or excision of small cysts or of hæmatoma of the ovary.

During the past eight years Norris has had 42 patients with chronic pelvic inflammation on whom conservative operations were performed. Of this series the results has been ascertained by personal inquiry, or by letter in 28 cases; 35 per cent. of these have failed to be benefited; 15 per cent. have undergone secondary operations for relief; 30 per cent. have been improved; 20 per cent. suffer no discomfort. Of 10 married women replying to inquiries, 2 have twice borne children. As the result of his experience the author concludes that "the results in the total series of cases have been somewhat discouraging and sometimes difficult to understand." In some cases, where the conditions were such that a brilliant result was anticipated, the condition remained as bad as before, and a second operation was necessary. On the contrary, in some cases, where the patient's wish had induced him to carry conservatism to an apparent extreme, the most fortunate results have followed. This means that the surgeon is unable to predict with confidence the result of conservative measures, and with this fact the patient should be acquainted, and her wishes consulted before the operation. The author believes that successful conservative work upon the tube is highly important from the standpoint of future pregnancy. Conservation of the ovary for the sake of impregnation very often results in a continuance of pain, and this the patient should be told is the price she may have to pay for the possibility of bearing a child. Norris believes that ovaries left behind which present more than one or two single and especially deep-seated cysts are likely to progress to diffuse structural changes and to require a secondary operation. The age of the patient also should be largely considered. An older woman, especially one who has borne children, should rarely be subjected to the risk of a conservative operation, while in a young girl such chances may be taken in an effort to preserve her womanly attributes.

**Vaginal Hemisection of the Uterus in Inflammatory Diseases of the Adnexa.** For several years the French surgeon Doyen, and Landau, of Berlin, have uniformly employed a method of hemisecting the uterus during a vaginal hysterectomy, in order to facilitate its easier and safer removal. In all of these operations the chief principle involved is the longitudinal sectioning directly through the middle of the uterus at the point of least vascularity. When the uterus is thus cut through, traction is made upon each half, and the vessels are put upon sufficient tension to control the hemorrhage; thus the removal of a half of the uterus at a time is much easier than to attempt to extirpate it *en masse*. At first thought it would seem that the direct cutting through of the uterus without using any clamps for the prevention of hemorrhage would be attended with great danger, but practical experience has shown this not to be the case. So far as Pryor's method

is concerned, it is an ingenious modification of the Doyen-Landau plan, and he therefore deserves the credit of inventing the instruments and perfecting the technique.

While, as I have repeatedly said in discussing the various methods of performing hysterectomy, I personally prefer the abdominal route, nevertheless there are some cases where unquestionably vaginal hysterectomy is to be preferred. This is especially so in very fat women, where the difficulty of reaching the pelvic organs by the abdominal route is very great. In such cases unquestionably vaginal hysterectomy is the preferable operation. From my own experience, which has been limited on account of my prejudice against vaginal operations, I, nevertheless, am inclined to value the methods first suggested by Landau and Doyen, and now brought especially to the notice of the American medical profession by Pryor. He<sup>1</sup> describes the technique of vaginal hysterectomy in cases of pelvic inflammatory disease. In this operation the patient should be in the ordinary lithotomy position, upon a table so constructed that the pelvis of the patient may be elevated and the benefits of Trendelenburg's position secured. The cervix is grasped with stout forceps and separated from the posterior vaginal wall by means of a circular cut made with strong blunt-pointed scissors. A crescentic fold back of the cervix when it is on the stretch indicates the line of the incision. The posterior peritoneal pouch is readily entered by pushing the finger through the peritoneum; if it is thickened it may be necessary to draw it down by means of mouse-toothed forceps to incise it. After examining the pelvic viscera through the peritoneal opening the anterior opening is made, and this is more difficult. If the incision is made at the point where the bladder joins the cervix the structures may be readily separated from one another by dissection along the plane of the loose areolar tissue. Pryor prefers to effect this separation by means of the end of the closed blunt scissors. After the level of the internal os is reached the finger is substituted and pushed through the peritoneum. So far the operator has attempted only to separate those adhesions which will enable him to determine the necessity for a radical operation; enucleation of the inflammatory masses has not begun. Up to this stage there are two sources of hemorrhage: one, the azygos artery has been cut in the posterior vaginal wall. Except in puerperal and fibroid cases, however, it does not even require compression with forceps. There is, moreover, very often a vessel of considerable size, a branch of the left uterine, which runs across the cervix to anastomose with the inferior vesicle. This is very large in puerperal and fibroid

<sup>1</sup> American Gynecology, February, 1903.

cases, and should be tied in every instance. The operator now splits the anterior wall of the uterus up as high as he can see, and by traction on either side of the uterine incision gradually draws down the uterus after each cut, until the fundus is reached and the entire anterior wall has been divided. A retractor containing a groove upon its anterior surface is now introduced back of the uterus and the posterior wall is divided by means of a bistoury. As soon as the uterus is halved its fixity is relieved, and subsequent manipulations are rendered less difficult by getting half of the uterus out of the way, while the inflammatory mass of either side is enucleated. The right half of the uterus is first released and shoved up into the pelvis, and all retractors removed. The left half of the uterus is drawn down and the left hand separates the adhesions to the adnexa of this side. When the inflammatory mass is freed sufficiently to draw in into the vagina the left half of the uterus and the left adnexa are returned to the pelvis, and the same procedure is carried out upon the right side. Up to this point no attempt has been made to secure haemostasis, as the application of forceps to control bleeding would have hindered the enucleation and made a complete operation difficult or impossible. It is infrequent, however, that more than fifteen minutes is required for the enucleation, and the bleeding, which is only parenchymatous, may be temporarily disregarded. Haemostasis is now secured by applying forceps to each side in succession. The left side of the uterus and adnexæ are drawn out through the vagina, and the pedicle of the mass thus formed, which contains the ovarian, round ligament, and uterine arteries, is compressed by the forceps and the mass cut away. Two forceps usually are sufficient: the first one grasps the ovarian artery and the artery of the round ligament; the second includes the uterus within its grasp. The right half of the uterus and the right adnexa are now treated in a similar fashion, and the operation is complete. The dressing is a most important part of the technique, and it is on this point that Pryor differs most with the French surgeons. A strip of iodoformized gauze is inserted on each side between the two forceps and the vaginal walls. Another piece is packed into the pelvic cavity above the ends of the forceps and down into the vagina, between the two sets of forceps, sufficiently tight to exert a firm bilateral pressure. This drainage is applied so as to isolate the stumps, which will slough, from the peritoneal cavity. Great care should be taken to so protect the forceps with the gauze that no part of them impinges upon the intestine or the rectum. A self-retaining catheter is now introduced into the bladder and the sphincter ani dilated, in order to lessen spasm of the levator ani and the sphincter muscle. The forceps are removed at the end of forty-eight hours; six hours later the permanent catheter is taken out and

the bladder is irrigated. Pryor has performed 228 such operations, with 1 death, a mortality of 0.4 per cent.

**Drainage after Abdominal Operations.** The perennial question of drainage still has two sides: one, which I believe is in the rapidly increasing majority, advocates the limitation of drainage to the fewest possible conditions; whereas the other takes the older stand of inclining toward the frequent use of drainage. Both experimental as well as clinical observations have conclusively proved that the glass tube or coils of gauze really have an infinitesimal function in the actual removal of infectious matter from the peritoneal cavity. At the uttermost, drainage can only promote adhesions directly around the drainage area, and possibly in this way limit infection to a given spot. But if infectious matter has once become distributed in the peritoneal cavity it is not of the slightest value in assisting in its elimination. While clinical evidence has steadily been accumulating against the promiscuous use of peritoneal drainage, nevertheless we find from time to time some surgeons of good repute who still advocate this antiquated system. As I have frequently said, such cases get well in spite of, not as a result, of this system.

For several years Olshausen has consistently advocated the limitation of drainage. Quite recently he<sup>1</sup> has again fully discussed this question in a very interesting paper dealing with his clinical cases. Referring to the history of the subject, he says drainage first came into general use after a paper by Marion Sims in 1872. Sims argued that in every abdominal operation the peritoneum was more or less irritated, especially when many adhesions were divided. As a consequence of this irritation a thin fluid is poured out which is not resorbed and which will become infected unless drained away. Olshausen quite correctly claims that at the present time such an argument is a reproach to aseptic methods. He mentions, furthermore, the rapid isolation of any drainage tract by means of peritoneal adhesions, and believes that drainage in the majority of pelvic operations has no effect in isolating the infected area from the general peritoneal cavity. He again calls attention to the fact that the peritoneum is able to take care of a certain amount of infection. The advisability of drainage is to be discussed especially for the following varieties of cases:

1. When the contents of a suppurating tumor reach the general peritoneal cavity (as in pyosalpinx, abscess of the ovary; also intra-peritoneal and intraligamentary abscess).
2. When malignant tumors are not fully extirpated and when the pyogenic wall of an abscess is left behind. (This class includes sarcoma

<sup>1</sup> Zeit. f. Geb. u. Gyn., Band xlviii. No. 2.

and carcinoma involving the bowel or peritoneum, or pyogenic membrane from the wall of a pyosalpinx or an ovarian tumor, or a suppurating hæmatocoele).

3. In penetrating wounds of the bowel or bladder, whether their contents exude or not.

4. In operations where the toilet of the peritoneum is not entirely satisfactory: as after the removal of ruptured ovarian tumors which have discharged their contents into the peritoneum; or in operations for pseudomyxoma peritonei and after the enucleation of old hæmatoceles, in which the thick brown blood flows between the loops of the bowel and cannot be entirely removed.

He reports in detail 114 cases, occurring in 1555 laparotomies during the past six years, in which there were indications for drainage as above noted. These cases represent the worst ones in the series of 1555, and in none of the 114 was drainage employed. There were 65 cases of the first variety, with 14 deaths; 10 of the second, with 1 death; 20 of the third, with 7 deaths; 18 of the fourth, with but 1 death.

It is possible by means of the Trendelenburg position, the author says, to remove all the pus from the pelvis, and if it has been spilled between the coils of the intestine and cannot be wiped away, no drain will remove it. As observed in 10 cases, there were portions of malignant tumors left behind. All of these patients had a normal convalescence except 1, who died six weeks later from cachexia. Drainage in such cases is dangerous, for it affords an entrance for infection to the portions of the tumor left behind. The author believes that laceration of the bowel or bladder during operation may always be safely closed; drainage in such an event is unnecessary. From his own cases, 18 of which fall under the fourth classification, he is of the opinion that drainage not only is not required, but is actually dangerous. He concludes that it is only necessary when a pus-producing passage is left behind, as is, for instance, frequently the case in perityphilitic abscesses. He does not use irrigation, because this may further spread the infection through the peritoneal cavity, and easily produce a certain grade of shock which may favor septic infection.

Sippel<sup>1</sup> wonders whether some of Olshausen's fatal cases might not have been saved by drainage. He himself would only think of this procedure in the first and third varieties of cases designated by Olshausen. In this variety of cases, however, he believes that a correct criterion can only be arrived at by the same operator comparing two series of cases treated by the two different methods. With regard to the use of irrigation with salt solution, he has never seen the bad effects

<sup>1</sup> Zentralbl. f. Gyn., 1903, No. 6.

(shock) described by Olshausen and Mackenrodt; on the contrary in very bad cases he has seen the pulse improved under such treatment.

From this review of Olshausen's article it will be seen that he reduces the conditions for drainage to the lowest possible number. Some years ago, after reviewing 1700 cases of cœliotomy performed in Kelly's clinic, I reached the conclusion that a drain should not be used except under three conditions :

1. General purulent peritonitis.
2. Abscess sacs impossible or inadvisable to extirpate, which are well walled off from the general peritoneum.
3. In the presence of intestinal wounds or where, for some reason, the integrity of an intestinal suture is doubted.

As will be seen in Olshausen's summary, he is inclined to rule out the third condition, and endeavors to make his intestinal suture so secure that a gauze tampon may not be necessary.

Since my review of these 1700 abdominal section cases, which made me a radical opponent to the promiscuous use of drainage, I have seen no reason to change my opinion ; on the contrary, I have become more fixed in it. As was pointed out at that time, physiological experiments have shown that the chief exit for serum, leukocytes, and minute foreign particles from the peritoneum is through the diaphragmatic lymph spaces. This current invariably sweeps upward from the lower abdomen to the diaphragm in an astonishingly short time, and minute granules are transported from the peritoneal cavity through the diaphragmatic lymph spaces, are deposited in the retrosternal glands, and subsequently are found distributed in the various excretory organs of the body. Based upon inefficiency of the drainage originally employed, and the fact that the peritoneum under all ordinary surgical conditions tends rapidly to free itself of infectious matter, we strongly advocated peritoneal infusion of normal salt solution. Just as in the question of whether a glass tube or gauze should be used for drainage, so likewise there have been very ardent discussions as to whether a dry or wet peritoneal toilet should be employed during abdominal operations. Thus, Olshausen has been a very constant advocate of the dry method, and unquestionably has had good results. But I do not believe his results are as good as they would have been had he resorted to irrigations of the peritoneal cavity and left a quantity of the solution behind. To say the least, the comfort of the patient is materially promoted by this means.

Recently, C. C. Norris<sup>1</sup> and I reported a series of experiments which prove beyond doubt the benefit of infusion of normal salt solutions into

<sup>1</sup> Journal of the American Medical Association, January 30, 1904.

the peritoneal cavity. We infected 25 rabbits with a lethal dose of a virulent culture of staphylococcus aureus. With this dose we infused into the peritoneal cavity 100 c.c. of normal salt solution; 44 per cent. of the animals survived. Every test animal, that is those in which salt solution was not used, died. I have reported a series of 254 consecutive laparotomies at the University Hospital: in this series there were 7 deaths, 6 of which occurred in cases where the use of salt solution was without influence; there were 2 exploratory laparotomies, 1 for tuberculosis (death in two months), the other for carcinoma (death in one week), both inoperable; in 1 case of cancer (death from pulmonary embolism) the salt solution was not used; 1 was a case of general suppurative peritonitis (death on table); 1 died within twenty-four hours after operation from streptococcus infection after removal of a cystic fibroid tumor; and 1 died of biliary complications fourteen days after operation.

But one of the cases could in any way be attributed to the use of saline infusions, at least in the sense of distributing the poison to the remoter parts of the peritoneum and the general organs of the body. We conclude that:

1. The use of salt solution does not increase, but unquestionably minimizes the dangers of pyogenic infection.
2. In addition to the reduction of mortality the convalescence of the patient is rendered infinitely more comfortable and satisfactory through the reduction of thirst, the increase in the urinary excretion, and the minimizing of vesical irritation.

As I have pointed out before, the salt infusion should not be employed in those cases in which the absorptive power of the peritoneum is greatly impaired, as in certain conditions accompanied by ascites, in ruptured extrauterine pregnancy, in which the peritoneum is already overtaxed by the removal of hemorrhagic débris, and in cases in which there is a considerable pus-producing focus left in the peritoneal cavity. In explanation of the latter it may be said that a localized abscess in any part of the abdominal cavity, which may be evacuated effectually by the usual surgical drains, should under no circumstances be broken up, thus throwing the danger of infection into the general peritoneal cavity. In all cases, however, where the abscess sac may be extirpated completely, as for instance in pyosalpinx, localized appendicitis, suppurating gall-bladder, etc., peritoneal infusions should be employed, and surgical drainage by gauze or glass tubes discarded.

**GONORRHOEA IN WOMEN.**

From the earliest period of medical literature this subject has been receiving more and more attention until the present time, when it is looked upon as one of the direst diseases which afflict women. The most complete study of this infection should, therefore, be made, for upon its limitation and cure depends the health of many women of the future. That we have made little progress in the actual cure of the disease is shown by the fact that the majority of gynecologists hold the doctrine, so strenuously advocated by Noeggerath, of "once infected always infected." This is certainly the case if this disease once gains access to the uterus and Fallopian tubes. We may extirpate these organs and relieve the terrible suffering, but this is not a cure of the disease. While all possible remedies have been advocated for the treatment of gonorrhoeal endometritis, the fact remains that it is essentially incurable. Why this is so is difficult to explain, for the infection is not deep-seated, nor is it, as a rule, carried beyond the genito-urinary tract. The micro-organism is a very feeble grower in artificial media, and requires the greatest care in its cultivation. The uterus is easily reached by topical applications, and yet the disease resists all treatments thus far advocated. This subject is, therefore, open for still further thought, and the following article, which comprehensively reviews the literature up to date, should have careful consideration, for it may offer valuable suggestions for treatment or point the way to further lines of research.

**Immunity and Toxin Formation.** Stahler<sup>1</sup> has made a comprehensive review of the recent literature upon this subject. Wassermann<sup>2</sup> made cultures of the gonococcus, killed the micro-organism at the height of its growth, and examined the culture fluid for a toxin. He thus discovered that the resulting toxin was so virulent that the smallest amount produces, upon local application, inflammation, fever, swelling of the neighboring lymph glands, and severe muscular and arthritic pain similar to that produced by the toxins of cholera bacilli discovered by R. Pfeiffer. No immunity is produced by the injection of the attenuated serum. Through Wassermann's examination an explanation is given for the symptom-complex of gonorrhoeal arthritis; also for the outbursts of inflammatory disturbance in the presence of encapsulated gonorrhoeal abscesses without the gonococcus being recognizable at the seat of acute inflammation, or at least in great disproportion to the severity of the symptoms. Investigations of Wertheim<sup>3</sup> agree

<sup>1</sup> Monats. f. Geburts. und Gynäk., Band xvii., Heft 1.

<sup>2</sup> Berliner klin. Wochenschrift, 1891, 32.

<sup>3</sup> Ibid., 1897, S. 700.

with the foregoing observations. He found that after the injection subcutaneously of a filtrate of pure culture of the gonococcus in serum bouillon there was no reaction, whereas from the subcutaneous injection of an unfiltered dead culture of the gonococcus, local swelling, pain, and rise of temperature occurred.

**Diagnosis.** Bröse and Schiller<sup>1</sup> believe that, as a rule, the recognition of the gonococcus is not necessary for the diagnosis of gonorrhœa. They base the diagnosis of chronic gonorrhœa in the female more upon the coincident infection of the different parts of the genital tract. Neisser<sup>2</sup> and his pupils, as well as most observers, insist upon the importance in diagnosis of the histological recognition of the gonococcus as well as in given cases upon its cultural proofs. This requirement for an accurate diagnosis is especially valuable in a forensic sense.

**Recognition of the Gonococcus in the Various Tissues and Organs of the Female.** In recent years there has been increasing evidence in favor of the teaching of Wertheim, that while the gonococcus may in general be regarded as a mucous membrane parasite, it may show the same invading tendency as the ordinary pyogenic micro-organisms. Mandl<sup>3</sup> positively demonstrated the gonococcus in the deepest layers of the subepithelial connective tissue of the vagina in 3 patients; 1 of these had previously had her uterus removed by total extirpation.

This corresponds with the observations of Doederlein<sup>4</sup> in a patient who complained of a burning discharge from the vagina three months after total extirpation, in which the gonococcus was found.

The first recognition of the organism in the free blood was made by Amann,<sup>5</sup> who established the identity of the diplococcus which he found with the gonococcus, not only histologically and culturally, but also through human experiments. The individual into whose urethra the inoculation was made suffered not only from a typical attack of gonorrhœa, but also from a suppurative tendovaginitis, in which gonococci were recognized. The organism has been found in the blood also by Unger, v. Leyden, and Michaelis. Lenhartz<sup>6</sup> cultivated gonococci from the pulmonary valves in ulcerative endocarditis. Ghon<sup>7</sup> and Schlagenhaufner demonstrated unmistakably that a fatal case of endocarditis was exclusively due to the gonococcus. The organism has also been found by v. Hochman in a subcutaneous abscess of the left elbow,

<sup>1</sup> Berliner klin. Wochenschrift, 1808, 26-29.

<sup>2</sup> Aerztl. Sachverst. Zeitg., 1895, 12.

<sup>3</sup> Monats. f. Geb. u. Gyn., Bd. v., Heft 1.

<sup>4</sup> Ibid.

<sup>5</sup> Archiv f. Dermat. u. Syph., Bd. xxxix., Heft 3.

<sup>6</sup> Berliner klin. Wochenschrift, 1897, S. 1138.

<sup>7</sup> Wiener klin. Wochenschrift, 1898, 24.

by v. Hansteen and Colombine in suppurating lymph glands, and by Nolen in a periarticular abscess. Furthermore, according to Finger, during the last years gonococci have been recognized culturally and microscopically in the pus of suppurative dermatitis by Horwitz, Bujwid, Rendu, Meyer, Almkvist, and Scholz, and gonorrhœal exanthemata have been described by Schautz<sup>1</sup> and Nolen.<sup>2</sup>

While I have long advocated the views of Bumm, that the gonococcus does not penetrate deeply into the tissues or spread to remote organs, it is impossible to continue longer this teaching in the face of these conclusive reports of other investigators. Nevertheless, I believe that as yet the rule holds that the gonococcus does not generally deeply penetrate from the surface into the underlying structures. That this rule is absolute is certainly disproved, however, by the above-quoted observations.

**Latent and Residual Gonorrhœa.** Noeggerath describes "latency of gonorrhœa" as the condition in which, although for a year there has been no signs of the disease, there may suddenly occur from unusual irritation to the sexual organs the symptoms of acute or subacute gonorrhœa. Luther believes the expression "latency of the gonococcus" would better describe this state than the term Noeggerath employs. Klein<sup>3</sup> believes that the disease is present, but that there is a clinical inability to appreciate the subjective and objective symptoms. Fritsch<sup>4</sup> would speak of "gonorrhœa without symptoms."

By residual gonorrhœa Saenger defines a condition of chronic disease which depends no longer upon the presence and activity of the gonococcus, but upon the tissue changes produced by the micro-organism at a previous time.

**Recurrence and Transmission of Gonorrhœa. Marital Gonorrhœa.** Wertheim,<sup>5</sup> as the result of observation and examination, says that there is no immunity from gonorrhœa and that in chronic gonorrhœa a fresh infection may occur. To its own infection the mucous membrane may, however, become somewhat accustomed. In marital gonorrhœa, after the gonococcus has passed through a third individual, it becomes again infectious for its previous host.

According to Neisser there is neither a diminished virulence nor an immunity against gonorrhœa. Julien<sup>6</sup> has lately made observations which entirely agree with those of Wertheim and Neisser.

<sup>1</sup> Inaug. Dissertation, Bonn, 1895.

<sup>2</sup> Zentralbl. f. Geb. u. Gyn., 1895, S. 988.

<sup>3</sup> Die Gonorrhœa des Weibes Berlin, S. Karger, 1896.

<sup>4</sup> Lehrbuch der Gynäk., 9 Aufl., Leipzig, 1900.

<sup>5</sup> Klein. Die Gonorrhœa des Weibes Berlin, S. Karger, 1896.

<sup>6</sup> Gonorrh. u. Ehe., Berlin, Vogel u. Kreinbrek, 1901.

**Prophylaxis.** Saenger recommends :

1. Measures to prevent the infection itself. To effect this end careful supervision of open and energetic suppression of secret prostitution is essential. Protracted treatment of infected prostitutes by gynecologists; prophylactic vaginal douches and prophylactic care of men should be advised. Protracted treatment of gonorrhœal men and absolute forbiddance of marriage are necessary if there is even a slight gleety discharge present.

2. Prophylaxis for children through instruction of the gonorrhœal mother.

3. Measures to secure recovery in light cases and prevention of severe forms of gonorrhœal infection.

Greife<sup>1</sup> says that in the question of prophylaxis attention must be paid to the man as well as to the woman. For the man he recommends :

1. Moral training to prevent sexual intercourse previous to marriage.

2. Careful inspection of all prostitutes at regular intervals.

3. As direct prophylaxis, the use of the condom or following coitus an injection of protargol, 20 per cent.

4. Every man afflicted with gonorrhœa should know that even in the absence of clinical symptoms he may be capable of transmitting the affection.

5. Marriage should not be allowed until a careful examination shows the man to be perfectly sound ; parents should insist upon a physician's certificate to this effect.

**Prognosis.** Klein<sup>2</sup> holds the opinion of Veit, Winter, Bröse, and others, that the acute infection is curable if, after the first infection, new infection can be prevented and the case handled with the greatest care. In chronic gonorrhœa, on the other hand, they consider the prognosis always grave.

**Treatment.** Small<sup>3</sup> says that acute specific urethritis in the female is not usually treated as a distinct affection. The symptoms which the patient presents are often attributed by her to cold in the bladder. In the first stage, often known as the "increasing stage," the discharge is small in amount and mucopurulent in character. The microscope shows many epithelial cells and few pus cells. While there are numerous cocci, the gonococci themselves are few in number, and confined almost exclusively to the epithelial cells. At this time local treatment is contraindicated. Carbonated and acidulous drinks are positively interdicted. Internally, potassium bicarbonate, potassium bromide, and salol should be administered every four hours until the dysuria is

<sup>1</sup> Zentralbl. für Gynäk., 1902, No. 28.

<sup>2</sup> Loc. cit.

<sup>3</sup> University of Pennsylvania Medical Bulletin, July, 1902.

somewhat relieved. Local treatment should be instituted when the discharge assumes a more purulent character and the microscope shows many pus cells, very few epithelial cells, an abundance of gonococci in the pus cells, and an absence of any other form of cocci. The treatment consists of irrigation of the urethra with *argyrol*, 5 per cent. solution. This is accomplished by means of a soft rubber catheter or Skene's reflux catheter. At the same time a capsule containing copaiba and sandalwood and one of the vegetable digestants, such as caroid or papoid, should be given. During this treatment careful notes should be made, especially with regard to the frequency of urination. A condition resembling the well-known posterior urethritis of the male may develop in women, appearing as a urethrocystitis, and includes considerable of the bladder surface. The diagnosis is based upon increasing frequency of urination, associated with profuse urethral discharge and terminal haematuria. Cystoscopic examination confirms the diagnosis. At this stage *argyrol*, 20 per cent. solution, should be applied directly to the bladder wall, while capsules of copaiba and sandalwood are administered internally. When the inflammation becomes limited entirely to the urethra, local application should be discontinued. At a time when the discharge shows pus cells, small in size, few if any epithelial cells, and the gonococcus is either absent or, when found, of a poorly nourished variety, then a slightly astringent injection, as

will help to dry up the discharge. If, after two or three weeks of such treatment, the microscope shows ill-defined pus cells, a few epithelial cells, the gonococcus, when found with its well-known distinctive features almost obliterated, a more astringent injection may be used, such as :

This will, in most cases, be followed by an entire cessation of discharge. If "clap shreds" persist in the urine the passage of a sound, with slight massage of the urethra to iron out, so to speak, all the mucous membranes, should precede the injection. When all the "clap shreds" are absent from the urine, after discontinuance of treatment for one week, and the patient has been allowed to use her own inclinations as to stimulants, and her menstrual period has passed without any discharge, the condition may be considered cured. A dis-

charge continuing for eight weeks or more must be classed as chronic. This is the form of urethritis most often seen by the general practitioner. From the standpoint of treatment chronic urethritis may be divided into three classes : anterior, middle, and posterior. The anterior, or the "urethritis of Guerin," is localized in the follicles, especially those referred to as Skene's, and four or five other follicles of the vestibule. In such cases pure ichthyol injected with a hypodermic syringe, having a blunt point, will quite frequently destroy the infection and prevent the tendency to abscess formation, and in most cases will give permanent relief. Ultimately, pure nitric acid or a Paquelin cautery may be used to entirely destroy the follicle. Middle urethritis, or urethritis posterior to Skene's follicles and extending to the sphincter, occurs in the form of chronic granular urethritis. The passage of a full-sized sound, with massage per vaginam, followed by irrigation with argentic nitrate in solution of 1 : 4000, increasing in strength to 1 : 1000, or ichthargon, 1 : 2000, will hasten the cure. The above treatment, continued two or three times weekly for from two to four weeks, followed by the use of a corrugated sound with Finger's ointment :

R.—Pot. iodid.	.	.	.	.	.	.	.	3jss.
Iodi. (pure)	.	.	.	.	.	.	.	gr. xv.
Ol. olivæ .	.	.	.	.	.	.	.	3jss.
Lanolin .	.	.	.	.	.	.	.	3ijj.

inserted in the urethra and allowed to remain five to ten minutes, almost always results in a cure. Chronic posterior urethritis is a form of vesicourethral fissure characterized by frequency of urination, and is marked by pain, with tenesmus at close of urination. Skene's or Kelly's endoscope, or a similarly constructed instrument, gives the best view of the condition. Infected areas may be hidden in the folds of mucous membrane, and unless these are opened out they may escape detection. The treatment consists of dilatation of the sphincter by the uterine dilator and the administration of urotropin, five grains every four hours, to make the urine as bland as possible. In severe cases the establishment of a vesicovaginal fistula may be necessary in order to give complete rest to the sphincter.

Inflammation of the vulvovaginal duct usually accompanies vulvitis. The injection of pure ichthyol here keeps the duct patent, thus eliminating predisposing tendency to abscess formation. At the same time it has a germicidal influence. If the gland itself becomes infected complete extirpation is the only measure to be considered, as numerous and serious transmissions of the disease can be traced directly to this point.

When gonorrhœa once infects the *cervix* it becomes very difficult to

treat. This difficulty lies in applying antigenorrhœal remedies to the cervix in such a way as to be efficient, and yet without danger of overstepping the bounds of the cervix and infecting the endometrial cavity. Small<sup>1</sup> has obtained good results here by using 20 per cent. argyrol in a straight syringe introduced as far as the internal os. The injection is made very slowly as the instrument is withdrawn. Menge, whose article on "Endometritis" was reviewed in PROGRESSIVE MEDICINE, 1901, believes that it is impossible to confine the treatment solely to the cervix. He therefore strongly advises the use of intra-uterine applications of formalin. With the treatment of *gonorrhœal endometritis* the treatment of *endometritis* in general may be considered.

Chaleix-Vivie<sup>2</sup> recommends the use of chemically pure *methylene blue* in the treatment of metritis. In a very finely powdered form it is of value in *metrorrhagia*, *menorrhagia*, and *leucorrhœa*; it produces no pain and has no caustic or toxic effect. It is also efficient in *dysmenorrhœa*. The author has also employed this drug in pregnant women suffering from gonorrhœal vaginitis and metritis. After several treatments both the pain and the discharge are diminished. Animal experimentation has shown that methylene blue introduced into the uterus quickly diffuses through all the layers of the uterus, and is germicidal for the gonococcus, streptococcus, staphylococcus, and the bacterium *coli commune*.

Dorland<sup>3</sup> speaks of the value of methylene blue in 1 per cent. solution in cases of gonorrhœal vaginitis. The vagina is first disinfected with mercuric-chloride solution, 1 : 2000, and is then flushed with 1 per cent. methylene-blue solution. He quotes Charles Sueur,<sup>4</sup> who regards methylene blue very highly in the treatment of chronic metritis. In addition to its bactericidal and analgesic properties, it acts as a vasoconstrictor and local venous depletor. Dorland also states that P. Michim<sup>5</sup> has found a substance chemically allied to methylene blue in the normal vaginal secretion. This substance is trimethylamine. It is universally found in health and diminished in states of ill health and inflammatory conditions of the genital tract. Trimethylamine is bactericidal. Dorland believes there may be some relation between this fact and the therapeutic properties of methylene blue.

Fischer<sup>6</sup> has invented and employed in 70 cases a form of intra-uterine syringe by which he is able to introduce into the uterine cavity a suitable solution in the form of a spray, without any admixture of air.

<sup>1</sup> American Journal of Obstetrics, 1903, vol. xlvi., No. 1.

<sup>2</sup> Zentralbl. f. Gynäk., 1902, No. 48.

<sup>3</sup> International Medical Magazine, October, 1903.

<sup>4</sup> Bull. gén. de therap., 1902, tome cxliv., No. 12.

<sup>5</sup> Shurnal Akuscherstwa i Shenskich Bolesnei, 1902, Nos. 7 and 8.

<sup>6</sup> Zentralbl. f. Gynäk., 1902, No. 43.

**Formalin Treatment of Endometritis.** Odebrecht<sup>1</sup> gives his views of intrauterine cauterization by means of formalin. He bases these upon a large number of cases. In the local treatment of endometritis there are in general two lines of therapy: either the mucosa is curetted away, or the mucosa is destroyed with some chemical or thermal agent. Before the appearance of Menge's paper Odebrecht had been in the habit of using chloride of zinc in ambulatory cases. This was rather unsatisfactory; a weak solution has no effect, and a concentrated solution is too destructive. After its application a very tough slough is formed, which separates slowly and serves as a good culture medium. Koch, moreover, has shown that chloride of zinc is a poor antiseptic. For this purpose formalin is quite superior to any other chemical. It penetrates the tissues easily, and is actively germicidal without destroying tissue. The author states that following its use he has never observed a slough, either at the portio or in the cervical canal, whereas, after the employment of chloride of zinc, such an event was of frequent occurrence. Formalin sometimes produces pain and hemorrhage, and sometimes there has been, after intrauterine cauterization by this method, symptoms which resemble the early signs of an exudative process. The author has never observed an actual parametritic or perimetritic exudate or salpingitis. Such consequences, however, he has observed after the employment of other means. Besides this negative advantage of formalin, it possesses positive ones in the way in which it diminishes hemorrhage, discharge, and pain, and leads to an improvement in the health of the patient.

How often should patients be exposed to this treatment? This is an important question. Its answer depends upon the condition of the patient, the intensity of the process, and the diameter of the cervical canal. Odebrecht has made the interval from ten to forty days. According to his experience, if after eight or, at the most, ten cauterizations the patient has not been relieved this method of treatment should be abandoned. The 50 per cent. solution of formaldehyde is used in preference to the 30 per cent. The stronger solution does not have any disadvantage, and has a greater therapeutic effect, so that fewer treatments are necessary.

Littauer<sup>2</sup> has devised a new sound for the treatment of chronic endometritis. It consists of a small nickel sound which resembles the American instrument, but it is not so long, and is held by a pair of dressing or hæmostatic forceps employed as a handle. These little nickel sounds are hammered out of nickel wire. On the point they are 0.2 mm. thick and 2.5 mm. broad, increasing up to 0.6 mm. thick

<sup>1</sup> Zentralbl. f. Gynäk., 1902, No. 49.

<sup>2</sup> Zentralbl. f. Gynäk., 1902.

and 3.5 mm. broad in a length of 10 or 11 cm. They end in a broader portion 2 cm. long, which is held in the bite of the forceps while they are being employed. They should be wound with strips of cotton in the usual way, and may be sterilized with heat and then packed up and used by means of a haemostat. These little sounds have the advantage over Menge's hard rubber ones in that they are thinner and more flexible, can be more easily introduced into the uterus, allow the use of any substance as caustic, except the mineral acids, and, finally, are much cheaper.

### RESUTURING THE SUPPURATING ABDOMINAL INCISION.

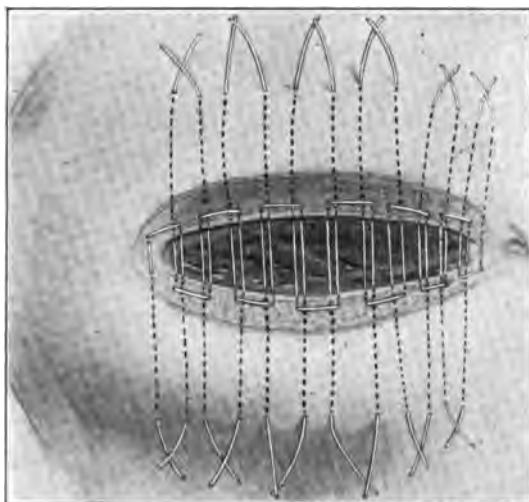
In some slow healing, suppurating wounds of the abdomen, the convalescence of the patient is greatly delayed by waiting for the complete closure of the incision before she leaves the hospital, and likewise its subsequent suturing is hazardous, on account of the thin cicatrix, thus predisposing to a hernia as soon as the patient gets on her feet. If, therefore, some method can be adopted for resuturing suppurating wounds, and thus not only make the incisions firmer, but likewise more definitely insure the patient against postoperative ventral hernia, it should certainly be employed. The following method which Harris describes appeals to me as being a feasible plan of attaining this end, and I believe the method may be recommended.

Harris<sup>1</sup> gives a description of his treatment of the abdominal incision where union per primam is defeated by suppuration. He does not discuss the methods of closure of the incision, nor does he consider those cases where unabsorbable suture material has been left behind. When the abdominal incision suppurates the condition may show itself between the seventh and twelfth postoperative day. By discovering the suppuration early, and by prompt evacuation, the destructive process may be limited. In spite of every care, however, Harris believes that in a considerable proportion of these cases the suppuration travels the whole length of the incision, and often through the fascia to the peritoneum. These cases are usually opened and thoroughly evacuated, and then allowed to heal by granulation. Such a process is necessarily more or less slow and tedious. From the eighteenth to the thirtieth day the process has reached a point where the granulations are healthy and the flow of pus has about ceased. Instead of waiting for cicatrization—a necessarily slow process, and one that leaves an unsightly abdominal scar—Harris curettes the incision about this time and reunites the edges throughout. The patient is etherized and placed

<sup>1</sup> American Gynecology, August, 1902.

upon the table without any previous preparation of the wound. After washing the wound well with soap and water it is scrubbed for four minutes with a solution of bichloride, 1 : 1000. Normal salt solution is then used, followed by curettage. Bichloride solution is now used again. After further washing with normal salt solution the wound is gone over carefully with a sharp curette, and the several layers so exposed as to render them recognizable. The retracted fascia, however widely separated, must be found. Finally, the wound is washed with a weaker solution of bichloride, and subsequently with normal salt. "The next and probably the most particular part of the operation is the manner of introducing the interrupted silkworm-gut sutures. (Fig. 42.)

FIG. 42.



Method of introducing the sutures.

The needle pierces the skin about one inch from the edge of the wound, is made to pass obliquely downward and inward, penetrating the fascia of that side near its edge and emerging from beneath it. The needle is next carried through the fascia of the opposite side from within outward. It then pierces that same fascia from without inward, and is returned to the fascia which it first transfixated and is made to perforate it, the fat and the skin from within outward terminating one-half inch either directly beneath or directly above the point of its introduction. The suture traverses the fascia in exactly the same manner as the so-called buried mattress suture, and differs from it only in being brought out and tied on the skin, about one inch to the right or left of the line of primary incision. The ends of the first

suture are grasped with the forceps. The next step is to introduce the second suture in a similar manner from the other side of the wound. When the fascia is reached the needle is made to perforate in a horizontal line in such a manner as to interlock the first suture.

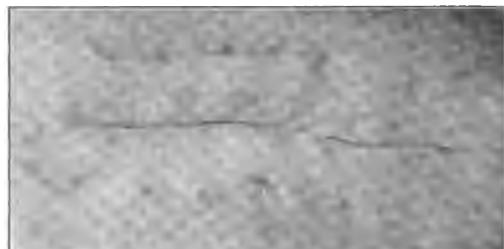
"The third suture starts on the same side as the first one, and it is so introduced as to interlock the second suture. The fourth suture is introduced from the same side as the second suture, and is made to interlock the third or preceding one. Thus each succeeding suture interlocks the previous one until the sutures are all introduced. The

FIG. 43.



Sutures introduced and tied.

FIG. 44.



Result.

wound is then washed again with a weak solution of bichloride of mercury, followed with a normal salt solution, and the sutures are tied one after another. When the wound is thus sewn the adipose tissue and skin fall and remain in apposition, and adhere without additional sutures. In some instances a catgut drain, which is drawn out in twenty-four to thirty-six hours, is introduced at the lower angle of the incision. One effect of this particular manner of resewing the wound is to produce a prominent welt, at the apex of which is the line of incision, and at the base of which on either side appear the knotted sutures." (Fig. 43.)

The wound is dressed by gauze rolls on either side of the welt. All of the wounds thus united secondarily by Harris have undergone firm and apparently deep union. The scars resulting are scarcely more pronounced than those following primary union, save, maybe, that the tying points of the sutures are more noticeable. (Fig. 44.) The author, as a rule, takes out the sutures on the twelfth day. He lays stress upon the method he employs of suturing and upon the repeated disinfection of the wound during the operation.

### THE FUNCTION OF THE CORPUS LUTEUM.

The function of the corpus luteum, from the time von Baer first discovered the ovum to the present time, has been an enigma. The fact that the follicle, which is the resting place for the ovum until its extrusion from the ovary, should be organized by the peculiar corpus luteum, having a gland-like structure which is maintained for a given time and then shrinks away, leaving only a minute scar to take its place, has no analogy in any other part of the body. Of late years much has been said concerning the internal secretions of the ovary. Thus far, however, these statements have largely been based upon hypotheses rather than upon well-authenticated observations or experiments. That the ovary has a specific influence upon the temperament and physical life of the woman there can be no question. The corpus luteum, having this remarkable evolution through its stage of progressive development and rapid retrogression, must have some characteristic or specific function which as yet has not been discovered. Its close analogy to a gland, and the fact that if the ovary is removed or destroyed psychical as well as physical changes take place, would strongly point to it as the source of the so-called ovarian secretions. The following article, therefore, must strongly appeal to us, not only because of its scientific interest, but especially because of its practical bearing upon the influence of the ovary in the development of woman.

I believe Ludwig Fraenkel<sup>1</sup> has contributed an epoch-making research upon the function of the corpus luteum. His experiments were carried out at the instigation of the late Gustav Born, who formulated the unpublished hypothesis that the corpus luteum of pregnancy, judging from its structure and development, is a gland with an internal secretion which is directly concerned in the implantation within the uterus and development of the impregnated ovum. Fraenkel's investigations upon 114 rabbits seem to show that this gland-like body is intimately connected with the functional activity of the uterus during

<sup>1</sup> Archiv f. Gynäk., Bd. lxviii., Heft 2.

the maternal period. There are a number of reasons, *a priori*, which seemed to make this probable, even before Fraenkel conducted his experiments. They are as follows:

1. The morphology of the well-developed corpus luteum is significant. It is larger than the follicle from which it originates or its subsequent scar. Histologically, it consists of large, epithelioid, polyhedral, succulent cells, the so-called lutein cells. These are arranged in single rows without intercellular substance, and between each row there is a capillary loop. The columns of rows run at right angles from the periphery toward the centre. From the capsule, vessels run inward, forming a mesh throughout the structure, within which lie the columns of cells that abut directly upon the endothelium of the capillaries. The entire picture is strikingly like that of a gland, like the structure of a liver acinus or the periphery of a suprarenal gland. The lutein cells represent the parenchyma; the capillaries not only furnish nutrient material for these cells, but also transport the secretory products away from them. The entire structure is therefore suggestive of a secretory gland.

2. One may further inquire: What is the function of this gland? The periodic repetition of the following phenomena, bursting of the follicle, escape of the ovum, fecundation of the ovum, formation of the corpus luteum, anatomical changes in the uterus which assist in the insertion and nutrition of the ovum, are cyclic changes which favor the conclusion that the corpus luteum possesses the function of preparing the uterus for the development of the fecundated ovum.

3. It would be easy to say that this relation between the uterus and corpus luteum should be reversed. That is, the growing ovum produces the changes in the uterus and coincidentally leads to hypertrophy of the corpus luteum. But evidence points to this theory as improbable. The ovum before its insertion can be regarded, in a certain sense, only as a foreign body. While it may, indeed, produce irritation in its immediate neighborhood, it can hardly exert a remote influence, because at this period it is connected with the maternal structures by neither vessels nor nerves. Against this hypothesis it is known furthermore, that while the fecundated ovum is still in the tube, the earliest uterine changes characteristic of pregnancy, such as the serous infiltration, the congestion, the hyperplasia of the tissues, and the decidual transformation of the uterine mucosa, have already occurred. In extrauterine pregnancy there are, moreover, similar reactions. Hence it is evident that the cause of these uterine changes must lie in some other factor than the ovum itself, and what is more logical than to search for it at the point where the greatest reaction, the formation of the corpus luteum, is taking place?

4. When the ovum becomes embedded in the decidua a hyperplasia of the entire uterus takes place. That this rapid growth is due to the irritation of the growing ovum is a difficult theory to maintain, for the uterus grows relatively much faster in the early months than the ovum. At this time the latter is scarcely perceptible to the naked eye, living principally upon its own nutritive yolk, and possessing an extremely delicate connection to the maternal tissues. In the later months, however, when the embryo has developed to a considerable size, the uterus has stopped growing, and is but passively distended, while the corpus luteum has become a scar, and has long since passed its stage of activity.

5. The structure and size of a Graafian follicle would seem to indicate that it is not alone for the purpose of protecting and maturing the ovum. It is necessary, perhaps, that the follicles should have a firm capsule (theca) and contain a suspending fluid (liquor folliculi), in order to protect the ovum and preserve it during maturation in an undisturbed state; but that the follicle should grow to the size of 1 cm. or more for an ovum scarcely perceptible to the naked eye is, at least, not plausible. One may, therefore, believe that the follicle reaches this size, because its lining cells (membrana granulosa) are to participate actively in the formation of the corpus luteum.

6. The capacity of the Graafian follicle is less than the dimensions of the mature yellow body. The latter becomes larger than the mature and greatly exceeds the size of the undeveloped follicle. This excessive hypertrophy would be unnecessary if the corpus luteum were nothing more than the transitional stage between the Graafian follicle and the corpus albicans.

7. The hypertrophy of the corpus luteum of pregnancy has been explained by the general hyperæmia of pregnancy. This is untenable for three reasons: first, because the yellow body enlarges entirely in disproportion to the remainder of the ovary, often occupying a half of the latter (in cows and in mares even four-fifths of the entire ovary); second, because the remainder of the ovary is decidedly anæmic at the time of greatest hypertrophy of the corpus luteum; third, because toward the close of pregnancy, when the congestion and hypertrophy of the genitalia are at their height, the corpus luteum is transformed into scar tissue.

8. Comparative anatomy indicates the correctness of Born's hypothesis. All animal forms which exhibit a uterine insertion of the ovum have well-developed corpora lutea; the same structure in egg-laying animals is either absent or rudimentary.

9. Another objection, which has been offered to the hypothesis of Born is that the lutein cells are of connective-tissue origin. Fraenkel

believes Sobotta has proved their epithelial origin from the granulosa cells by the study of thousands of serial sections taken at all stages of the developing corpus luteum.

Moreover, the question of their origin is partly irrelevant, for it has been found recently that glandular formations may be produced from mesodermal tissue. Fraenkel carries out three sets of experiments to determine :

1. The influence of the ovary upon the insertion of the ripe fecundated ovum.
2. The influence of the ovary upon the further development of the ovum after it has become embedded.
3. Whether the corpus luteum possesses these function *in toto* or in part.

The author shows, by reference to the writings of Bischoff, von Benden, Sobotta, Kossman, and others, that several days (four to seven) elapse between fruitful copulation and the insertion of the ovum in the uterine cavity. He found that rabbits in the period of rut following labor copulated in 88 per cent. of cases ; 41 per cent. of these copulations resulted in pregnancy. All animals used in the experiments had been delivered recently, and copulation took place in the first period of heat thereafter. He took out both ovaries in 13 of these animals, and after a suitable period made autopsies, which in every case showed the uterus empty. To show that this did not depend upon the operative manipulation, in 14 cases he removed but 1 ovary, and 6 of these rabbits continued pregnant.

To answer his second query he operated upon 9 pregnant rabbits between the eighth and twentieth day following coitus. In these cases he either removed both ovaries or burnt out all of the corpora lutea on both sides. In every case the number of embryos in the uterine horns was noted at the time of operation, and in every case the operation was followed by degeneration of the products of conception. In order to determine the part which the corpus luteum plays in the embedding of the ovum, they were destroyed in both ovaries of 11 rabbits in which fecundation had presumably occurred, but in not one of them was pregnancy subsequently noted. Pregnancy continued in 2 out of 8 cases where the corpora lutea were but partially destroyed. From these experiments he concludes that corpora lutea functionally favor the embedding of the ovum and assure its further development.

The author endeavored, without results, to produce by partial destruction of the corpora lutea a pathological insertion of the ovum or a faulty development. He believes that there is a connection between pathological conditions of the corpus luteum and the development of the ovum, because of the frequent occurrence of ovarian tumors

and hydatiform moles, and of corpus luteum cysts and tubal pregnancies. He further believes that the corpus luteum is essential to the normal nourishment of the uterus, because :

1. After castration or destruction of the corpora lutea the uterus of non-pregnant animals undergoes atrophy.
2. In the presence of corpora lutea there is a marked parallelism between the state of nutrition of the corpus luteum and the state of nutrition of the uterus.
3. The corpus luteum verum, although larger in its structure, coincides entirely with the corpus luteum spurium. He removed the largest corpus luteum of the largest Graafian follicle in 7 suitable laparotomies in order to determine whether menstruation in women depends upon the internal secretion of the yellow body. With one exception the next period was missed, and menstruation did not return for from four to eight weeks later. The author reaches the conclusion that there is no difference between the physiological action of the corpus luteum verum and the corpus luteum spurium. The same yellow body may exist in the insertion and nutrition of the impregnated ovum or, in the failure of the latter to occur, induces menstruation. Menstruation, therefore, is produced by the secretory activity of the corpus luteum, and not, as assumed by other writers, by the pressure of the growing follicle upon the ovarian nerves. The author has endeavored to put into practical use his theories. He gives dried pulverized corpora lutea of the cow in doses of 0.3 gm. three times daily. In 14 cases of artificial climacterium, in which he used this remedy, he had uniformly good results in preventing or alleviating the distressing symptoms common to this condition. In cases of amenorrhœa and in dysmenorrhœa it was employed without results. The fact that the corpus luteum is the essential functioning part of the ovary explains why oophorin (the dried powder of the entire ovary) is so unstable in its effects. Naturally its value in any case would depend upon the amount of lutein substance it contained, and this, of course, varies within wide limits.

In line with this research Pick<sup>1</sup> claims that in cases of hydatiform mole, which have been subjected to careful examination, both ovaries contained a large amount of lutein tissue. The cases referred to include those of J. Neumann, Schaller-Pförringer, Poten-Vassmer, Stoeckel, and Pick. This fact draws our attention to the relation between changes within the corpus luteum and the development of hydatiform mole. He believes that an overproduction of lutein tissue may cause an overgrowth of chorioepithelium, leading to either hydati-

<sup>1</sup> Zentralbl. f. Gynäk., 1903, No. 34.

form mole or eventually to chorioepithelioma. Runge has recently reported seven cases of chorioepithelioma, in which characteristic transformations were observed in the corpora lutea. These changes may consist of multiple cysts of the corpus luteum or an invasion of the ovarian stroma by the lutein cells. The views of Pick are quite in accord with the hypothesis of Born and Fraenkel concerning the function of the corpus luteum.

### THE FEMALE URINARY SYSTEM.

**A New Cystoscope.** At various times in PROGRESSIVE MEDICINE I have called attention to the different methods of cystoscopy, and note below a new instrument devised by Cullen, which may prove of considerable value in the inspection of the bladder. Cullen has attached to the Kelly cystoscope a small electric lamp which carries the illumination directly into the bladder, instead of the indirect illumination as employed by Kelly. While I have not had an opportunity to test this instrument, it nevertheless appears to be a good one, and, as it is much cheaper than many instruments on the market, it will no doubt not only find a place in the armamentarium of the specialist, but also prove of value to the general practitioner.

This new form of electric cystoscope<sup>1</sup> for the female bladder resembles a short male cystoscope. The lamp is relatively large in size and, therefore, not so apt to burn out; moreover, it gives a better light than the lamps usually employed. If by any chance the light should give out, the instrument may be used in the same way as an ordinary Kelly cystoscope. A Rochester electrician has invented a new transformer which enables one to use the ordinary street current, and which is easy to handle and durable. The connections of the cystoscope are all covered; the instrument is sterilized by immersion in pure carbolic acid for ten minutes; it is then rinsed in alcohol and, finally, in sterile water.

**Urethral Labia.** Kelly<sup>2</sup> describes an important anatomical peculiarity of the urethral orifice and discusses the diseases of Skene's glands and their treatment. He says: "If a virginal vaginal orifice be examined, taking care merely to expose the parts without separating them, the urethral orifice will be found completely hidden, being covered by two lips, one on either side, in close connection with the anterior part of the hymen. By the approximation of these lips the cutaneous orifice forms a simple vertical line, from 2 mm. or 3 mm. to 10 mm. beyond the level of the vestibule. These folds are connected with the pos-

<sup>1</sup> Johns Hopkins Hospital Bulletin, June, 1903.

<sup>2</sup> American Medicine, September 12, 1903.

terior part of the urethral orifice and project up over the anterior portion of it, with the patient lying in the dorsal position. They are sometimes short and inconspicuous. At others, longer relatively to the urethral orifice than are the labia minora to the vaginal orifice. They are most marked at the period of greatest sexual activity, disappearing with age. They are also wont to disappear after numerous childbirths, being replaced by a patent urethral orifice without distinct labia. In cases where they have been partially destroyed their previous position is often indicated by a line crossing the urethral orifice, giving it a characteristic cruciform shape. These folds have a mechanical function, and are clearly intended to protect the mucous membrane of the urethra from mechanical injury and invasion by the micro-organisms so abundant in the vaginal secretions."

These structures Kelly has named "labia urethræ." The late Dr. Skene described two elongated, tubular, gland-like structures, lying parallel to the anterior urethra in women, and opening at the bases of the labia urethræ. Koch declared that these so-called glands were nothing more than the remnants of the lower ends of the Wolffian ducts. Schüller showed that they were definite tubular glands. They differ from the ordinary lacunæ of the urethra in that the orifice is narrower than the canal back of it. Furthermore, the upper distal parts of the tubes are branches, and receive a number of straight or corkscrew glands. He opposed Koch's view that they were remnants of the Wolffian duct for several reasons: first, no trace of them could be found in early embryonic life; second, the epithelium, instead of being of a cylindrical type and disposed in one or two layers, was of the same transitional form as that found in the urethra; third, Gaertner's ducts lie in a septum between the urethra and vagina, whereas Skene's glands show no tendency to approach the vaginal track at all; fourth, the presence of a third tubule occasionally is taken as an evidence against the possibility that they represent the Wolffian ducts.

Kelly subscribes to the opinion of Schüller in this controversy. He believes the function of Skene's glands is to furnish a lubricant to moisten the labia urethræ and prevent harmful attrition of the delicate urethral mucosa during coitus. By far the majority of cases of inflammation of Skene's glands are due to the gonococcus, although they may become invaded in any inflammation of the vulva, urethra, or vagina. Skene distinguished two varieties of inflammation:

1. A mild form, in which the orifices of the ducts are surrounded by a narrow, bright-red areola. Pressure upon the glands show the presence of a white serous fluid. This condition rarely gives rise to marked symptoms.

2. A severe form, purulent in character, extending from the epithe-

lum of the ducts into the surrounding tissues. There is usually slight prolapses and eversion of the mouths of the ducts, which bring them more prominently into view, and considerable infiltration about the urethra. The parts are exquisitely tender, and the patient complains of pain in walking or sitting. There is no pain on irritation.

For the examination of Skene's glands Kelly recommends :

1. Palpation, to determine their size and consistency and whether tenderness be present.
2. Compression, to reveal their contents.
3. Sounding, to find their length and direction.
4. Injection, to estimate their capacity.

Kelly treats chronic affections of these glands by systematic emptying of the structures, followed by the injection of disinfecting solutions. If this does not suffice, the glands may be opened and packed, burned out with the cautery, or excised *in toto*. The solutions used for injection are tincture of iodine, carbolic acid, and nitrate of silver. A blunt-pointed hypodermic needle is used, to which is attached a short (four inches) piece of rubber tubing, closed at its distal extremity. This improvised syringe may be filled by expressing the air from the tube and then immersing the point in the solution about to be employed. The orifices of the glands may be exposed by the use of a hairpin bent to form a speculum of small proportions. The blunt point of the needle is now introduced to the very bottom of the gland and the injecting fluid slowly forced into it by squeezing the rubber tube. Excess of fluid escaping from the gland is caught upon absorbent cotton. When carbolic acid is used the parts about the orifice are touched with alcohol, followed by warm boric acid solution. When nitrate of silver is used the parts are guarded in a similar way by pledges soaked in salt solution. The author urges that attention should be more regularly paid to these glands of Skene.

**Postoperative Cystitis.** Baisch<sup>1</sup> has described the methods in vogue at Döderlein's clinic, in Tübingen, for preventing postoperative cystitis, the results of which have been very satisfactory. According to Baisch, postoperative cystitis is a bacterial inflammation of the bladder consecutive to operation, in which the innervation or nutrition of the bladder has suffered and catheterization is required. It is alike impossible in all cases to prevent the entrance of germs or the infliction of injury to the bladder. The use of the catheter is avoided as far as possible, and to this end, when the patient is unable to void urine, the bladder is stimulated by an injection of 2 per cent. solution of

<sup>1</sup> Münchener med. Wochenschrift, 1903, No. 38; Journal of the American Medical Association, October 24, 1903.

boric acid in glycerin. This is done the evening after the operation, if the patient has not voided urine spontaneously. A Nélaton catheter is inserted into the bladder, and as soon as the first drops of urine appear the syringe is applied and 20 c.c. of the boroglyceride injected. Usually after five to ten minutes the patient has a strong desire to urinate, and evacuation of the bladder follows in the natural way. No troublesome sequelæ have been observed, and only in rare cases does it become necessary to repeat the injection. This occurs sometimes after anterior colporrhaphy, and, as a rule, the bladder is so much injured in a Wertheim operation for carcinoma that it cannot respond to this stimulus. In such cases, after the inevitable catheterization, the bladder is rinsed out each time by 500 c.c. of a 3 per cent. solution of boric acid.

By these measures cystitis is prevented in nearly every instance. Rinsing should be continued with each catheterization until urination becomes spontaneous and complete.

**Stricture of the Ureter.** Kelly<sup>1</sup> says it is strange that, although very much has been written about stricture of the urethra, there has been little said about the same condition of the ureter. This would not be true if ureteral stricture gave rise to such urgent and unmistakable symptoms as the analogous condition in the urethra. The symptoms of ureteral stricture are often misinterpreted and the condition entirely neglected. When the kidney finally becomes affected, and the surgeon is called upon to treat hydronephrosis or pyonephrosis, the organ is victimized, and the operator feels that he has successfully coped with an affection of the kidney. Quite the contrary; in opposition to the true teachings of scientific surgery, he has treated the effect, but left the accessible cause untouched. Kelly draws distinct differences between the terms stricture and obstruction of the ureter: a stricture is a narrowing of the calibre of the canal through tissue changes in its own wall; obstruction, however, may depend upon the pressure of some neighboring organ or tumor or the presence of a calculus. The difference in their mode of treatment is this: that in one the obstruction may be removed without altering the actual calibre of the ureter; in the other, however, the strictured area must be dilated or excised. The author classifies these strictures according to their (a) location, (b) extent, (c) cause.

(a) The almost invariable seat is at the vesical extremity or somewhere within the true pelvis. One case was noted at the renal extremity, and one in the abdominal part.

(b) Ureteral strictures have been noted from a few millimetres to several centimetres in length.

<sup>1</sup> Journal of the American Medical Association, August 16, 1902.

(c) Usually inflammatory conditions in the ureteral walls are caused by the tubercle bacillus; next in frequency are the ordinary pyogenic cocci; it is rare for the gonococcus to come into evidence here.

As for the symptoms of ureteral stricture, Kelly knows of none that are characteristic; but renal or vesical symptoms that are not easily explained should draw attention to the ureters. Examination of these structures includes (a) palpation, (b) inspection, (c) catheterization.

Palpation is possible by either the vagina or rectum. The latter route is especially applicable to the upper pelvic portion of the ureter. After evacuating the bowel the patient should be put in the knee-chest position and the rectum distended with air. Upon a resumption of the recumbent posture no difficulty is experienced in palpating the ureter along the lateral and posterior pelvic wall. A diseased structure may be plainly nodular or it may simply seem tighter or shorter than its fellow, and its vesical orifice may be drawn toward the affected side. Upon inspection of the ureteral orifice one finds that it is sometimes swollen, deeply injected, or surrounded by areas of ulceration. The opening is often obscured, so that it appears like a mere dimple in the midst of a large cushion of puffy mucosa, or its presence is indicated merely by a few radiating lines on an elevated ridge of vesical mucosa. This ridge is formed by the expansion of the bladder, giving unusual prominence to the rigid thickened ureter. Catheterization of the ureter reveals a stricture by the difficulty experienced upon the introduction and withdrawal of the instrument. When the catheter is in position a colored solution injected into the pelvis of the kidney does not find its way along the sides of the catheter into the bladder; this usually occurs, however, if the ureter is normal. The extent of the stricture may be determined upon withdrawal of the catheter, by noting the point at which the flow of injected fluid ceases, and the point at which the instrument is no longer held in the bite of the stricture. Kelly summarizes the methods of treatment as follows:

1. Dilatation of the stricture by flexible or metal catheters in a graduated series up to 4 or 5 mm. in diameter. This is the ideal method.
2. Freeing the ureter from a bed of inflammatory tissue by dissecting it out. This is occasionally sufficient.
3. Resection of the ureter. This is rarely possible.
4. Extirpation of the entire supravesical urinary track of the affected side by a nephroureterectomy or a ureteronephrectomy, or, as he has done in one case, a nephroureterocystectomy. This is the only reliable method in cases of tuberculosis, as well as of pyoureter and pyelonephrosis of long standing.
5. Amputation and implantation of the bladder. This is applicable

when the stricture is low down, the opposite side diseased, and the diseased side still capable of doing some work.

6. Complete division of the stricture. This plan may be of service when the stricture is unusually tight.

In conclusion the author states that "important accessories to the treatment and preliminaries to any active operative interference are the evacuation of the old urine or pus accumulated above the stricture, and the sterilization of the upper urinary tract by injections of solutions of boric acid, bichloride of mercury, silver nitrate, or formalin."

### DISEASES OF THE VULVA AND VAGINA.

**Pruritus Vulvæ.** Monk<sup>1</sup> discusses the subject of pruritus vulvæ. Hebra, the dermatologist, defines pruritus as a chronic affection of the skin manifested by persistent itching and accompanied by no demonstrable skin lesions other than that produced by the more or less incessant scratching to which the suffering leads. Kaposi regards pruritus vulvæ as a sensory neurosis. He would not include under this head cases due to eczema, prurigo, or the parasites. Pruritus vulvæ is, according to Kaposi, a disease entity, and is similar to other forms of local pruritus occurring in both male and female, and accompanied by no lesion of the cutaneous or mucous surface, except those the result of scratching. The latter, here, just as in cases of scabies and pediculosis, may give rise to pathological changes in the affected parts which make the discovery of the essential disease difficult. A number of gynecologists agree with Olshausen, who calls the disease in question essential pruritus. Simpson speaks of idiopathic pruritus, and Beigel and Zweifel attribute it to unknown alterations in the central nervous system. Sänger opposed the views already quoted, and said that he had never seen a case of persistent pruritus except as the result of skin disease. He looked upon pruritus as a consequence of a local disease of the vulvar mucosa, affecting the nerve endings there, and produced by various internal and external irritants. Sänger accepts the views of Webster upon the pathological anatomy of the affection. The latter found in tissue excised from the vulva of a patient suffering with pruritus a fibrosis of the nerve and of the nerve endings. Sänger tabulates the causes of pruritus, and, although Monk does not agree with him in his definition of this affection, he believes that Sänger's systematic arrangement of the etiological factors which may produce vulvar itching is valuable to the physician, because it will enable him

<sup>1</sup> *Prag. med. Wochenschr.*, 1902, No. 45.

to remember all the possibilities in the practical treatment of the individual case. Sänger's classification is as follows :

*A. Endogenous causes.*

1. **Hæmatogenous.** Icterus, nephritis, diabetes mellitus—from the products circulating in the blood—bile, uric acid, urea, sugar, all of which irritate the nerve endings and produce itching. In the same way morphine, alcohol, iodine, and other chemicals may produce pruritus.

2. **Congestion.** Venous stasis of the hemorrhoidal veins and the pampiniform vessels; in heart-failure, pregnancy, retroversion of the uterus, and uterine tumors.

3. **Hæmatogenous skin diseases.** Erythema, urticaria, herpes, eczema.

*B. Exogenous cases.*

1. **Chemical action of secretions.**

(a) **Hyperhydrosis, seborrhœa.**

(b) Continuous wetting with normal or pathological (diabetic), intensely acid (uric), purulent, alkaline (ammonia) urine.

(c) Pathological discharge from vagina and uterus (acute and chronic gonorrhœa, putrefying blood, catarrh of the cervix, cervical polyp, carcinoma, and other new-growths).

(d) Catarrhal and purulent secretion from the rectum, which first produces pruritus ani and then leads to pruritus vulvæ. This secretion is intensely irritant, and, especially in cases of adiposis and uncleanliness, leads to the worst form of pruritus. Some general causal factors, as neurasthenia, hysteria, sexual excesses, obtain here.

2. **Parasites.**

(a) **Animal** (pediculi, oxyuris vermicularis).

(b) **Vegetable** (leptothrix, leptomitus, oidium albicans, micrococcus ureae. Conditionally also the gonococcus, smegma bacillus, putrefactive organisms, the different skin parasites, streptococcus, and staphylococcus).

3. **Mechanical.**

(a) **Primary**—masturbation; too frequent cleansing, especially with sponges.

(b) **Secondary**—rubbing and scratching produced through itching.

4. **Thermal.**

Under this head belong pruritus aestivus, pruritus hæmalis, and the increase of itching produced by a warm bath.

Veit believed that pruritus is only a symptom, the result of an original affection which gave rise to the intolerable itching, but that the original cause is not the cutaneous alteration. He said pruritus vulvæ is a symptom of widely different diseases, and is produced by the chemical action of excretions from the urinary apparatus, intestines, or genitalia upon the vulvar skin. Scratching may produce a skin lesion and perpetrate the symptoms, although the original source of

irritation is removed. In such cases it is sometimes extremely difficult to find the basis of the trouble. From his own experience with patients in Carlsbad, Monk is inclined to agree with the views of Schauta, who defined pruritus as a hyperæsthesia of the vulva, and believed that it occurred both as a pure neurosis and as a neurosis combined with inflammatory processes in the region of the vulva. Monk does not believe that this affection should be looked upon as a mere symptom. He would, moreover, not class as pruritus vulvæ those vulvar irritations due to well-defined eczema, prurigo lichen, and parasitic infections. That the real pruritus depends upon more than local factors is shown by the frequent absence of symptoms when there are present the local conditions which have been cited as causes of pruritus. The effect the central nervous system may have in the production of pruritus is shown by a case of Monk's, in which the husband of a woman suffering from pruritus, hearing continually of the affection, was troubled by a similar itching in his urethra and promptly referred it to an infection from his wife. Through general treatment both were cured, and no local cause of the affection could be found.

**TREATMENT.** The treatment must be directed to the local condition and to the eradication of the original source of the affection, if it can be discovered.

Fissures and excoriations should be touched with argentic nitrate and Hebra's ointment applied. In eczematous eruptions preparations of sulphur and of tar are serviceable. Among internal remedies bromide, arsenic, and iron are recommended. Nerve sedatives, phen-acetin, pyramidon, and others are sometimes efficacious. External applications of cold or cold-producing applications are beneficial (alcohol and ether preparations, Goulard's extract, menthol ointment), and often take the place of a narcotic. The same therapy has different degrees of efficiency in different patients. The recommendation of P. Ruge and Lassar, viz., the disinfection of the vagina and vulva with antiseptic solutions (carbolic acid, corrosive sublimate) affords good results when systematically carried out, and there is no skin lesion that contraindicates the washing and the employment of chemical disinfectants. Unguentum belladonnæ, chloral ointment (5 to 10 per cent.), and Hofmeister's emulsion (potassium bromide, 2 : lupulin, 2 ; calomel, 10 ; olive oil, 20) are productive of good results in many cases. Narcotics are to be avoided as far as possible; especially is this true of opium and its alkaloids. Gymnastic exercise and general treatment are important in reducing the general nervous irritability. Mineral waters and baths, as those at Carlsbad, are of service, in that they stimulate the portal circulation and reduce congestion of the pelvic venous channels. Operative treatment is only to be employed in the

severest cases, and after they have persisted for a long time. Cases of persistent pruritus sometimes, after a considerable time, subside spontaneously.

The method of infiltration anaesthesia introduced by Siebourg is sometimes efficacious. It consists of infiltration of the tissues with normal salt solution. That it is capable of curing pruritus is yet to be demonstrated.

Hirst<sup>1</sup> says that the treatment of *idiopathic pruritus vulvæ* is one of the unsolved problems of the day. The number of agents suggested for the relief of this affection shows their general inefficiency. Surgical treatment seems to be the most reliable. Of the two principal surgical procedures one is the operation first described by Schroeder : excision of the affected skin followed by plastic repair. The other is a resection of the nerves which supply the vulva. The resection of the pudic nerve alone cannot be expected to cure a pruritus vulvæ ; the only method certain to accomplish this result is to cut off all the sensory nerves supplying the part. This can be done by making four incisions —two in the groin as for an Alexander operation, and two on the buttocks. The latter are parallel with the ascending ramus of the ischium, begin just above the tuberosity, and are two inches long. By the groin incision the genital branch of the genitocrural and the ilioinguinal nerves can readily be exposed. After isolating the nerves they are divided and as long a distal portion as possible is removed from each. The inferior pudendal nerve is found crossing the ramus of the ischium an inch above the tuberosity. The perineal branches of the pudic are less easily discovered, but painstaking dissection will usually isolate them in the upper outer part of the ischiorectal fossa, in the case of the posterior superficial perineal branch on the fascia to the inner side of the ischiatic ramus. When the clitoris is involved its dorsal nerve should be resected. This lies beneath the inferior layer of the triangular ligament, alongside the inner surface of the ascending ramus of the ischium, and to the outer side of the pudic artery. Hirst has had two intractable cases cured by this method. Another question which must be considered in relation to this operation is—will there result from this resection atrophy of the vulva and kraurosis vulvæ ? If kraurosis should be a consequence and epithelioma develop in association with it, there will be grave reasons for not adopting the procedure.

**Lupus Vulvæ.** Grace Peckham Murray<sup>2</sup> makes a second contribution to the study of those ulcerative lesions of the vagina commonly called lupus or esthiomene.

<sup>1</sup> American Medicine, May 20, 1903.

<sup>2</sup> American Journal of Obstetrics, June, 1902.

The patient whom Murray made the subject of her first contribution in 1887 was again observed shortly before her death, which occurred in 1900. The progress made by the disease during that time was observed and a bacteriological study carried out by Louise Cordes. The disease is characterized by slow ulceration of the vulva without much pain, and with little constitutional disturbance. The parts affected are of a violet color, considerably thickened and indurated, and to a greater or less degree gradually encroached upon by the ulceration. In fifteen years Murray observes that many of the tags of tissue about the ulcerative area were eaten away and the configuration of the vulva somewhat altered. During this period the disease had not advanced far into the vagina, although when first seen it had begun to dissect the vagina from its attachments. The entrance of the vagina had been narrowed by the formation of cicatricial bands. The study of these cases is difficult, because they are so infrequent. The name has been always a point of discussion. Veit and Freund agree with Virchow in calling it *ulcus rodens*. Others consider it with the syphilides. Lupus also has been considered in this connection. R. W. Taylor, in 1890, after an extensive review, concluded that lupus has nothing in common with this disease, and regards it either as ulcerative lesions due to irritation or as a manifestation of syphilis. Murray thinks the disease is primarily an inflammatory condition of the vulva. Because of the irregularity of the folds of the part, the constant attrition and exposure to irritating conditions, all breaks in the mucosa are difficult to heal.

The etiology of this affection is more or less obscure. Many investigators believe it to be a tuberculosis of the skin of the parts; in other words, lupus. There is no well-recognized organism of syphilis, so that from a bacteriological standpoint we are at sea in regard to its syphilitic nature. In Murray's case an organism was isolated by Louise Cordes. The same organism was found again in pure culture after one year's interval. It was a streptothrix which proved to be pathogenic for white mice and rabbits, and non-pathogenic for guinea-pigs. The epithelium bordering on the ulceration, upon histological examination, was found to be invaded by the threads of this fungus. Histological examination of tissue removed from the edge of the ulcerative area in this case showed no signs of tuberculosis.

Winckel described two cases in 1890 that he designated as *lupus vulvæ*. Birch-Hirschfeld made the diagnosis in the second case, and found groups of round cells surrounding giant cells; he has not stated whether tubercle bacilli were found or not. Taylor, in 1890, reported his histological studies made in this connection, and criticised the diagnosis of lupus upon finding the giant cells alone, calling attention to the true significance of giant cells in granulation tissue. Haberlin, in

1890, reported a case in which the evidences of tuberculosis were absent. Rieck and also Freund believe that in a majority of cases tuberculosis is at the bottom of the trouble, and not found in the microscopic examination because the latter usually follows the process of repair. Cordes says it is impossible to judge the value of the bacteriological study in Murray's case until other like investigations have been made.

**Non-specific Vaginitis.** Smith and Radkey<sup>1</sup> report a case of vaginitis caused by the *oidium albicans*. The patient was a young married woman about eight weeks pregnant. A previously existing leucorrhœa suddenly became profuse and caused intense vulvar burning and pruritus. Later on the vaginal discharge became thick, viscid, somewhat grumous, and of a dirty brownish hue, the color apparently being due to admixture with blood. On examination the vulva presented the following appearance of follicular vulvitis: the walls of the vagina were covered with large numbers of grayish-brown, slightly elevated masses, which were easily detachable. Beneath them there was a desquamation and swelling of the mucosa. These masses were picked off from the vaginal wall, and the patient was treated with antiseptic douches. She aborted in several days and her symptoms promptly subsided. An examination of the grayish-brown masses showed them to be made up of epithelial cells, overlaid by mycelial threads and colonies of *oidium albicans*. Their dark color in contrast to the usual light color of thrush patches is probably to be attributed in part to the presence of red blood corpuscles.

*Mycotic vaginitis* due to the *oidium albicans* is not so infrequent as one might suppose from the little attention that has been paid to the disease in text-books. Especially in American literature the subject has been disregarded. Pozzi, von Herff, Kölliker, Scanzoni, and others describe the condition in considerable detail. It is supposed to occur especially in pregnant women having patulous vaginas. The affection is sudden in onset and is accompanied by marked pain and itching, and an intensely acid vaginal discharge in which there is more or less admixture of blood. The local appearance of the mycotic patches may resemble ordinary oral thrush, or the patches may be darker in color and appear as slightly elevated points with mucous or gelatinous appearance. The intervening mucous membrane may be normal or swollen and red; beneath the mycotic patches it is eroded and swollen. Concerning the etiology of the disease, Hausmann speaks of the infection of pregnant or parturient women from children with aphthous stomatitis. In a number of cases infection can be readily traced to this source. The writers call to mind also the element of causation found in the

<sup>1</sup> Medical News, New York, June 27, 1903.

occasional physiological glycosuria during pregnancy. Friedreich first pointed out how the retention of even small amounts of diabetic sugar from the urine about the parts might favor the growth of a parasitic protophytes.

This form of vaginitis or vulvovaginitis as a disease entity is clear. Hausmann and others have long shown the importance in its etiology of the oidium albicans. The use of such remedies as bichloride of mercury in the form of a douche is quickly followed by the disappearance of the symptoms and of the aphthous patches.

**Carcinoma of the Vulva.** Peterson<sup>1</sup> thinks that primary carcinoma of the vulva has heretofore not been given the importance it deserves. While it is acknowledged that the affection is rare, statistics of Gurlt and Gönner seem to show that it is more frequent than is customarily supposed. Gurlt's calculations give 10 per cent. of all cases of carcinoma in the female as vulvar in location, and Gönner estimates that carcinoma of the female genitalia affects the vulva in 5 per cent. of cases. Noble and Hirst have reported cases. Beyea saw but 1 case during a period of six years' observation at the Gyncean and University Hospitals, Philadelphia. While Peterson has met with 4 cases, I have seen but 1 case at the University Hospital during the past four years.

Carcinoma of the vulva attacks women at a later period of life than is usual in most other parts of the genital track; 58 per cent. of Winckel's cases were over fifty years old. It may occur at the age of thirty-one years, as reported by West.

Although the disease may begin at almost any area of the vulva, the sulci between the labia minora and labia majora, a little below the clitoris, seem to be its favorite point of origin; the urinary meatus is but rarely the seat of the disease. In 3 of Peterson's cases intense pruritus was the first symptom; pain was marked in 1 case. Metastases to the original gland may or may not occur; in 23 cases collected by Schwartz, 11 had enlarged inguinal glands; but 5 of these, however, showed carcinoma upon histological examination. The treatment should be radical. Excision of the growth itself should be preceded by extirpation of the inguinal glands on both sides; if the excision is done first there is danger of infecting the inguinal incisions. The glands should be removed in all cases, for we are often unable to say whether they are diseased or not. Both sides of the vulva should be removed—the clitoris, both labia minora, and both labia majora. The incisions should be elliptical, and start well above the base of the clitoris. They must meet below, half-way between the anus and fourchette, leaving a strip of mucosa about the urinary meatus, unless it

<sup>1</sup> American Journal of Obstetrics, June, 1903.

also be involved. Peterson urges cauterization of the ulcerated parts before the lines of excision are made. The author believes that the prognosis is better in carcinoma of the vulva than in carcinoma of the uterus. Early operation, of course, is imperative. Schwartz had 10 permanent recoveries in 23 cases, but this must be regarded as a more satisfactory result than the majority of surgeons have noted.

# DISEASES OF THE BLOOD. DIATHETIC AND METABOLIC DISEASES. DISEASES OF THE SPLEEN, THYROID GLAND, AND LYMPHATIC SYSTEM.

BY ALFRED STENGEL, M.D.

## THE BLOOD.

**Pernicious Anæmia.** **Etiology** Although the past year has not been so prolific in publications relating to this disease, certain articles are of importance because of their bearing on the much-discussed but yet unsettled question as to the etiology and nature of the malady. Among the most extensive articles may be mentioned that of Bloch,<sup>1</sup> who discusses in detail the numerous theories hitherto advanced, and adds a new one which has many points to commend it.

First of all, Bloch insists that the term "progressive pernicious anæmia" fails to properly define the disease from secondary anæmias which may run a pernicious course, and suggests the name of "Biermer's progressive anæmia," under which are to be included only those cases whose clinical course coincides with the features laid down by this observer.

Bloch bases his discussion on a series of "about" fifty cases personally observed, but gives details of only one in which special features were present.

One of the most popular theories of the causation of pernicious anæmia is that it is due to a toxin formed within the intestinal tract absorption of which brings about the haemolysis believed to be the direct cause of the anæmia. In favor of this view are the post-mortem findings of atrophy of the gastrointestinal glands, thus giving an apparently good reason for the toxin formation on account of decomposition. Against this belief Bloch offers certain objections. In the first place there exists no conclusive proof that an automanufactured toxin is the causal agent in pernicious anæmia, though this conception explains many things plausibly. The author tried by various animal experiments to show the hypothetical toxin.

<sup>1</sup> Deutsche Archiv f. klinische Medicin, Bd. lxxvii. . 3 and 4.

Extracts were made from the feces of patients in different stages of pernicious anæmia and injected into animals without producing the classical symptoms of pernicious anæmia, and in general the results were the same as when extracts from the feces of healthy individuals were used. The injected animals sometimes died promptly and sometimes showed indefinite symptoms, but the blood changes were slight.

Investigations on the ethereal sulphuric acids gave varying results, besides these bodies are not toxic. The presence of indicanuria, on which Grawitz lays stress, Bloch found to be by no means constant, and where present to be dependent on interference with the bowel movements. This condition is to be looked upon as the result of insufficient albumin metabolism and may occur under similar conditions in the otherwise healthy individual.

Observations on the toxicity of the urine also gave uncertain returns. One might expect to find a diminished toxicity if there was a diminution in the excretion of the normally formed toxins, or an increased toxicity if the conditions were due to an abnormal formation of toxic substances. Neither supposition could be proved. From his experiments he was not justified in believing that pernicious anæmia was due to the presence of a toxin in the body. Injections of blood serum from pernicious anæmia patients into mice and guinea-pigs gave no result except the production of a marked eosinophilia. It must, of course, be recognized that all of these methods of investigation are crude and uncertain.

The results of the investigations on the metabolism of patients with pernicious anæmia speak against the theory of intestinal origin. In desperate cases shortly before death an increased excretion is found, but this is easily explainable on the ground of impaired appetite and under-nutrition. If in these cases it is possible to increase the intake of food it is easy to bring about albumin assimilation. One gains the impression that the metabolism in pernicious anæmia corresponds to the condition of the patient and his ability to take nutrition. In the severest stages of the disease before regulation of the diet a considerable portion (up to 20 per cent. in one of Bloch's cases) of the nitrogen of the food is passed in the feces unused, because of the insufficiency of the intestinal glands. These metabolism investigations have shown that even in patients with marked atrophy of the intestinal glands and pernicious anæmia the assimilation of the food can be good.

Grawitz has urged that these favorable metabolic findings are due to the selected diet, and, therefore, do not speak against the intestinal origin of the disease. Bloch, however, calls attention to the fact that recurrences are not prevented by the most carefully regulated diet, nor is a cure brought about by this means.

Concerning the role played by atrophy of the gastrointestinal glands in

the production of pernicious anaemia, Bloch is skeptical. Pathological findings have shown him that even with complete atrophy of the gastric glands the more important ones of the intestine may be intact. Practically the amount of atrophy is unimportant, providing the food is assimilated. Even where for a long period the assimilation and absorption of the food are interfered with, the autopsy has shown the presence of functioning glandular tissue. Besides, it is difficult to say how much of the intestinal condition may be due to the post-mortem changes.

Finally, it may be mentioned that infants with atrophy of the intestinal glands do not show pernicious anaemia, nor are these changes found constantly in patients dying from the disease. Taking the statements of the author as a whole, I cannot regard them as strongly invalidating the gastrointestinal theory of etiology.

In accord with these ideas of Bloch, that pernicious anaemia is not dependent on intestinal conditions, are the views of Einhorn.<sup>1</sup> In discussing the relationship between achylia gastrica and pernicious anaemia this author states that his observations speak against the assumption that atrophy of the gastric mucous membrane caused pernicious anaemia, for the following reasons :

1. In most cases of achylia gastrica a nearly normal condition of the blood is found. In one case of achylia gastrica, in which at autopsy a total atrophy of the stomach mucous membrane was found, pernicious anaemia did not exist during life.

2. We occasionally observe the presence of gastric juice in cases of pernicious anaemia, sometimes even in an increased amount, as is evident from the three cases reported. If pernicious anaemia were caused by atrophy of the gastric mucous membrane the achylia would have to be well marked as soon as the symptoms of blood disease are apparent.

We cannot deny that achylia gastrica and pernicious anaemia may occur together. These cases are, however, in the minority, and would probably point to a common cause for both affections, or that pernicious anaemia finds a ready soil in cases of achylia gastrica. We must also think of the probability that in grave cases of pernicious anaemia in the last stages of the disease changes may occur in the stomach and intestinal glands (atrophy) just as analogous changes in the spinal cord have been observed in this disease.

Lademann<sup>2</sup> believes that the theory of the formation and absorption of some toxic agent in the intestinal tract is the most plausible, and on this basis his plan of treatment consists in daily irrigations. Somewhat different is the opinion of G. Finzi,<sup>3</sup> who believes that a factor in the

<sup>1</sup> Medical Record, February 28, 1903.

<sup>2</sup> American Medicine, January 17, 1903.

<sup>3</sup> La Riforma Medica, December 27, 1902.

production of pernicious anaemia is an extreme alteration in the mesenteric lymph glands, which assist in the process of chylification, and hence to the renewal of the elements of the blood. While it is indisputable that intestinal atrophy may be secondary to anaemia, it is not easy to see why enlargement of the mesenteric glands should be supposed to be secondary to alterations in the blood. It should rather be held to occur as the result of some infection originating in the intestinal mucosa, whether as a complication of chronic catarrh, parasites, tuberculosis, or cancer. And, while, on the one hand, a pernicious anaemia may follow a slow puerperal infective process, with lesions of the haematopoietic organs, on the other hand, it is probable that in not a few cases its source of infection is to be found in the lymphatic mesenteric apparatus, since the mesenteric follicles and glands are to be regarded as the principal seat of the function and transformation of the morphological elements of the lymph.

Bloch does not claim that pernicious anaemia may not be due to an intoxication, but disputes the formation of such a toxin in the intestines as a result of decomposition. Experiments on animals with phenylhydrazin and its combinations, pyrogallol, toluidendiamin, dinitrobenzol, etc., produced anaemia, but of the secondary type. Megaloblastic degeneration of the bone-marrow and retinal hemorrhages, so characteristic of pernicious anaemia, were not seen, while haemoglobinæmic inner bodies were noted in the erythrocytes—a condition never seen in pernicious anaemia.

The form of anaemia supposedly due to a toxic substance most closely corresponding to pernicious anaemia is that seen in *bothriocephalus anaemia*. Bloch, however, believes that the relation between the parasite and the blood degeneration is by no means a close one. Thus it may be noted that healing does not always take place after the removal of the worm, and it might be thought that the two conditions were independent. No undoubted case hitherto reported has been observed sufficiently long after apparent healing from removal of the parasite to make it certain that the healing was not one of the intervals of latency so common in pernicious anaemia. Schaumann has observed in long lasting bothriocephalus anaemias that periods of improvement occur, lasting months or even years, which are not due to treatment, and that healing can occur without removal of the worm or before the worm has been passed. Bloch also calls attention to the infrequency of anaemia in localities where bothriocephalus infection is common and to the infrequency of pernicious anaemia in comparison to the frequency of bothriocephalus disease. There is evidently a tendency to look upon any pathological condition found in pernicious anaemia as the causal factor. Thus cases are cited in which small carcinomata found at

autopsy were considered to be the source of the anaemia. These, Bloch thinks, were simply accidental occurrences developing in patients suffering from pernicious anaemia, but in nowise to be considered as causal. As proof of the possibility of pernicious anaemia existing in conjunction with another disease, Bloch cites the following case-history :

A seamstress, aged eighteen years, whose family history was good, was admitted to the hospital on account of erysipelas. At the time she looked chlorotic. The lungs were then normal, but later she developed a cough, with profuse expectoration.

On readmission to the hospital (April 17, 1898) she showed marked anaemia, with a greenish-yellow color of the skin; emaciation and swelling of the left leg in consequence of a thrombosis of the femoral vein, and a temperature of 38° C.

There was catarrh of the left apex and infiltration in the right intraclavicular fossa, and a blowing systolic murmur could be heard over the entire heart. The spleen was palpable. Small retinal hemorrhages were noted. The urine was negative. The sputum contained tubercle bacilli. The blood count showed haemoglobin, 20 per cent.; red cells, 926,000; leukocytes, 26,220. The differential count showed the polynuclear neutrophiles to be 87.94 per cent.; polynuclear eosinophiles, 0.34 per cent.; large lymphocytes, 1.38 per cent.; small lymphocytes, 1.34 per cent. Microscopically, there was marked poikilocytosis in form and size; normoblasts and megaloblasts, some of which showed mitoses and some degeneration of the nuclei, and granular degeneration of the red cells. The blood condition gradually improved, until on August 10th the haemoglobin amounted to 58 per cent.; the red cells, 3,450,000; white cells, 33,120. During the two following months the blood picture remained unchanged. The tuberculosis extended, and the patient died in October. No autopsy was obtained. During the last weeks the stained specimens of the blood showed no evidence of the previous severe degeneration.

Bloch believes that this case shows a typical Biermer's anaemia existing along with pulmonary tuberculosis, the former slowly improving without the administration of arsenic, which was not well borne. The course of the case showed that the two diseases developed independently and that each ran its own course. He believes this to be also true of a case reported by Obrastzow and Wyssokowitsch, in which pernicious anaemia was thought to have developed in consequence of a subacute miliary tuberculosis.

For other etiological factors, especially lues, the causal relation to pernicious anaemia does not appear to Bloch to be proven. At least he doubts that various conditions, such as carcinoma, malaria, and syphilis, are alone able to bring about the anaemia of Biermer. So many people

suffer from these ailments, from unhygienic influences, from repeated and lasting hemorrhages, or chronic suppuration without developing, except in a small proportion of cases, severe anaemia, that one must believe there exists a special disposition in the cases affected. This idea must place the etiological factors above mentioned in a subordinate position. I have always believed and repeatedly stated that a certain deficiency in haemogenesis is of great importance along with excessive haemolysis.

Bloch believes that this special disposition is to be found in a weakness of the red cells, since he considers that the final clinical picture of pernicious anaemia results from a high-grade destruction of the erythrocytes within the blood paths. That red cells of this kind may be formed presupposes necessarily a deficiency in the bone-marrow. This primary weakness of the bone-marrow does not, however, consist in the production of cells in insufficient numbers, but in cells which are individually less resistant and yield more readily to deleterious influences. From this point of view Biermer's progressive anaemia is not an essential disease of the blood, but can be traced to a primary asthenic composition of the blood-forming tissues.

This theory requires for the productions of the disease two factors : first, the tendency, and second, the determining cause. From *a priori* grounds it is to be expected that when the determining factor is very strong a lessened predisposition is necessary to bring about the disease, and *vice versa*. The question now arises as to whether a sufficiently strong external factor could not produce the malady, even when no tendency exists ; or if, with a very marked tendency to the disease, it may not be brought about by the normal demands of the body. Bloch does not believe that external conditions alone are sufficient, but admits the possibility of the disease arising idiopathically. The conception of Biermer's progressive anaemia as an etiologically sharply circumscribed disease which is brought about by a specific irritation is not in contradiction to the view above expressed. Under this theory the so-called protopathic forms would be those in which the constitutional anomaly was congenital ; the deuteropathic, those in which the congenital tendency was increased by accidental causes or an organic weakness produced by definite disease, as carcinoma, lues, or bothriocephalus. Out of this congenital or acquired defect would the disease develop when the stimulus thereto is given by a specific poison.

If this view be true a proper understanding of the process necessitates a more accurate knowledge of the nature of this disease in the blood-forming tissues. This knowledge may be sought in two ways : one may attempt to learn what changes, if any, are present in the erythrocyte which diminish its resistance to external influences, or

whether certain changes are present in the general organism which will allow of any conclusions concerning the disease. Thus Beneke and Krauss have found that chronic anaemia develops by individuals who show a relative smallness of the heart and liver, a relatively increased size of the lungs, a relative narrowness of the arteries, and a relative shortness of the small intestine. Such individuals show a retarded development and are thin and meagre. Bloch, however, cannot agree with these results, as he has never seen hypoplasia of the circulatory apparatus in pernicious anaemia.

Investigations as to the resistance of the red blood cells by the methods of Landois, Hamburger, and others have shown a diminution of resistance in pernicious anaemia, but according to Bloch, we are handicapped in judgment by not being able to show whether these defective cells are very young, very old, or of the fully ripened type, and it is of importance in this connection to know concerning the fully matured cells. A method of functional diagnosis is necessary in order to fully explain the matter.

This hypothesis, Bloch thinks, explains the peculiar course of the disease and the failure of remedial measures. Nature seeks to repair the disturbed equilibrium by gradual transformation of the fatty marrow into the blood-forming tissue. This increase of blood-forming tissue does not necessarily mean augmented resistance of the red cells, but more likely an increase in the number of cells to make up for the excessive destruction. The success of this attempt will depend on the intensity of the irritation producing the disease and on the constitutional composition of the tissues of the affected individual as well as upon the amount of the normal functional demand. The prognosis will depend on the presence or absence of compensation and the ability of the organisms to adjust itself to the new conditions. We can thus understand the rapidly fatal course of the aplastic form of pernicious anaemia, and also the bad prognosis when the disease develops in children. In the first instance no regenerative attempts occur, and in the second on account of the deficient formation in young tissues regeneration is incomplete. The treatment should be directed toward rendering the occurrence of this compensation more easy or toward diminishing the demands on the tissues present. Hence protection and rest are essential, as these reduce the demands on the body generally. At the same time improvement in the general condition is to be sought. By these means it may be possible to bring about a pause in the course of the disease. The action of arsenic is explained on the ground that it exerts a tremendous stimulation on the bone-marrow, but has no specific action on the disease. This stimulation leads to increased production of red cells and, possibly, to the production of more resistant cells.

The theory advanced by Bloch, that individual disposition plays the important role, coincides with opinions that I have frequently expressed. Whether future discoveries will prove his hypothesis in detail is problematical. Cases, however, continue to be reported in which the anaemia arises during certain conditions which apparently are of moment in acting as the determining factor.

Thus Elder and Matthew<sup>1</sup> report two fatal cases of pernicious anaemia occurring after labor.

Case I. Patient, aged twenty-nine years. Previous history good. She had had three children ; all of her labors were easy, and there had been no hemorrhage. During her last pregnancy, while not feeling well, she was able to be about and do her work. For two weeks preceding labor she had been troubled with vomiting. She was delivered four weeks before admission. Labor was normal. For ten days after delivery she felt well, but on the eleventh day she had a shivering spell. These chills recurred daily for about ten days. An abscess developed in the right breast, which discharged for a few days and then healed. Ten days after delivery she noticed that she was becoming pale and yellowish. General weakness followed, with increase of pallor. On admission, March 15th, she was very weak, not well nourished, and extremely pale. The physical examination was negative, except for a haemical murmur at the base of the heart, with a hum in the neck. The blood count showed haemoglobin 20 per cent.; red cells, 1,100,000; white cells, 6000. Stained specimens showed a marked difference in size of red cells, more than 30 per cent. being megalocytes. Nucleated cells were fairly numerous, the majority being megaloblasts. Mitotic division was seen in the nucleus of some. Poikilocytosis was present, but not well marked. There were a few myelocytes. The patient died seven days after admission, but no autopsy was obtained.

Case II. Patient, aged thirty-one years. Admitted February 11, 1903. Family history good, and her own health had been good up to three years before, since which time she had been more or less feeble. Her first child was born two years and three months previously. Labor was long, forceps were used, and there has been considerable hemorrhage. She improved slightly, but was an invalid for three months. Her second child was born nine weeks before admission to the hospital. During pregnancy she had been quite well. This labor was also instrumental, but there was no hemorrhage. During the first week she suffered from ulceration of the tongue and throat. She got up after the tenth day, but was not able to do any work. Two weeks after birth of the child she noticed that she was becoming very pale, and at

<sup>1</sup> Lancet, August 8, 1903.

this time was troubled with vomiting and diarrhoea, which improved under treatment.

Examination on admission showed weakness of the heart-beat, with a hæmico murmur at the base. Pulse 112, irregular in time and force. Signs of consolidation at the right apex. There were no enlargement of the glands or of the spleen. The blood count showed 550,000 red cells, falling to 400,000 a week later; white cells, 5000, falling to 3000, and hæmoglobin, 20 per cent., falling to 10 per cent. Stained specimens showed numerous megaloblasts, megalocytes, and a few myelocytes. At autopsy there was found a general pallor of all the organs. Tuberculous nodules in the apex of the right lung. Numerous small subpericardial hemorrhages. The alimentary canal showed no microscopic lesions. The marrow of the long bones was red, showing megaloblastic degeneration. The liver was mottled, showing much pigment in the liver cells which gave the iron test. The spleen showed no excess of iron, and there was no deposit of iron in the kidney tubules, which, however, showed desquamative nephritis. The author comments on the infrequency with which pernicious anaemia following labor has been reported.

In both of these cases a very bad condition of the teeth had been noted, though they were not able to obtain any history of gastric or intestinal trouble.

These cases are of interest on account of the apparently very short course, and in that respect are similar to one reported by Krokiewicz,<sup>1</sup> occurring in a man aged thirty-two years. This patient claimed to have been perfectly well until three months previous to admission, when illness began with pain in the region of the stomach and the right hypochondrium, together with constipation and loss of appetite.

Excepting for exposure (his occupation was that of a raftsmen) no etiological factor could be determined, as he denied venereal and alcoholic excess, and lues could be excluded.

In all the disease lasted but five months, and the diagnosis was confirmed by autopsy. During this period the red cell count fell as low as 240,000 per cubic millimetre. All treatment was ineffectual.

**Leukæmia. ACUTE LEUKÆMIA.** In the two preceding numbers of PROGRESSIVE MEDICINE this subject was dealt with rather exhaustively. The past year has added but little to our general knowledge concerning the more common varieties, and the publications on acute lymphatic and chronic myelogenous leukæmia may be left unconsidered for the present. It has long been a subject of discussion whether or not myelogenous leukæmia occurred acutely, and the article of Billings

<sup>1</sup> Wiener klinische Wochenschrift, 1903, No. 19.

and Capps<sup>1</sup> relative to this question is important. They report a case of acute myelogenous leukaemia as follows :

The patient was a man aged sixty-eight years, with a negative family history. His habits were good, and he gave no history of venereal infection. At the age of fifty years he suffered from nervous prostration. Nine years previous he was jaundiced from the passage of a gallstone. Seven years previous he was subject to uræmic headache. Four years previous a fistula developed. The present illness began in August of 1899 with an ulceration which formed at the root of a decayed tooth. Weakness and loss of flesh were present. The jaw-bone was carious. A blood examination was made at that time by Dr. R. C. Cabot, and showed a normal condition. September 20th the weakness increased, and the patient complained of anorexia, indigestion, constipation, and sleeplessness. He was emaciated, had marked pallor, and his temperature was slightly elevated. The spleen could not be felt, and no hemorrhages were noted. The glands were not swollen.

Blood examination : haemoglobin, 40 per cent. ; red cells, 2,000,000 ; white cells, 540,000. The stained specimens showed only moderate poikilocytosis, and there were 2160 nucleated red cells to 1 c.mm., most of which were normoblasts. Small mononuclear leukocytes, 4 per cent. ; large mononuclears, 39.2 per cent. ; polynuclear neutrophiles, 24 per cent. ; eosinophiles, 1.6 per cent. ; mast cells, 0.8 per cent. There were 30.4 per cent. of myelocytes, of which 2.4 per cent. contained eosinophile granules. The condition of the patient grew rapidly worse. Hemorrhages occurred under the skin and from the gums in the region of the necrosed bone. The temperature was elevated, and there were profuse sweats. Edema of the lungs appeared. By October 7th the anaemia had become very marked and the gums were spongy and bleeding. The pulse became rapid, and the heart was moderately enlarged to the left. A soft systolic murmur was heard at the apex and the aortic second sound was accentuated. The spleen was distinctly palpable one finger's breadth below the ribs. The urine was scanty, containing a large amount of albumin and many granular and hyaline casts. Death occurred from asthenia about two months after the onset. The last blood examination on October 7th showed the haemoglobin to be 30 per cent. ; red cells, 1,700,000 ; white cells, 374,000. There were 2618 nucleated red cells to 1 c.mm., most of them normoblasts. Small mononuclears, 1.6 per cent. ; large mononuclears, 22 per cent. ; polynuclear neutrophiles, 21.2 per cent. ; eosinophiles, 0.4 per cent. ; mast cells, 0.4 per cent. Myelocytes, 54.4

<sup>1</sup> American Journal of the Medical Sciences, September, 1903.

per cent., of which 0.8 per cent. were eosinophiles. Many free nuclei were scattered about in both specimens. The classification of the myelocytes and large mononuclears was often arbitrary, since the granulations were frequently faint. The mononuclear cells corresponded in size and appearance to the myelocytes, save for the absence of the granules. The large mononuclears varied in diameter from 14 to 20 microns, while the myelocytes ranged from 12 to 20 microns.

In discussing acute leukæmia Billings and Capps review the literature very thoroughly. Fränkel collected all the cases up to 1895, including ten cases of his own, and came to the conclusion that all acute leukæmias were lymphatic, and this belief was verified by Pinkus, Ehrlich and Lazarus, Fussell, Jopson and Taylor, and others. Walz, however, objected to this view, as does Grawitz, Hirschfeld and Alexander, and Ewing. Billings and Capps have been able to collect seven clear cases of acute myelogenic leukæmia besides their own and two cases which are rather doubtful. In these eight clear cases the following symptoms were noted :

Most of the eight clear cases began abruptly in the manner of an infection, four cases had a throat inflammation, and in three there was a necrosis of the jaw or palate. With two exceptions the glands were slightly or moderately enlarged, the cervical group being usually affected. The spleen was always large enough to feel. In only two instances, however, was the edge more than one finger's breadth below the costal margin. Hemorrhages occurred in every case where the history was obtained. Fever was present in most cases, and was of an irregular, low-grade type. The anaemia was always severe and rapid, yet poikilocytosis was usually less marked than in a pernicious anaemia correspondingly severe. The white cells varied from 16,000 to 540,000. The average count was much lower than ordinarily found in the chronic myelogenic leukæmia. The diagnosis must be made from :

1. Chronic myelogenic leukæmia with acute exacerbation (Reimann). Here the blood picture is the same as in the acute form, but the history of a long illness and the very large spleen are diagnostic.

2. A lymphatic leukæmia complicated by some intercurrent infection (Hirschlaaff). The presence of many polynuclear neutrophiles makes a peculiar picture, but the myelocytes are few in number.

3. Acute lymphatic leukæmia where the large mononuclear cells predominate. Selig has called a case of this kind an "acute mixed leukæmia." This is untenable, as no myelocytes are present.

4. Acute infections associated with a grave and rapid anaemia may give rise to nucleated red cells and myelocytes. Leube reports such a case, and considered the condition due to irritation of the bone-marrow. The white count is generally lower than in acute myelogenic leukæmia.

5. Acute exacerbation of pernicious anaemia may cause mistake if the blood has not been previously examined. Thus in a case of pernicious anaemia reported by Billings, two days before death the white count was 34,000, 29.4 per cent. of which were myelocytes.

6. New-growths involving the bone-marrow. This is characterized by the enormous number of nucleated cells, a chronic course, gradual anaemia, and rather few myelocytes.

The differential diagnosis between acute myelogenic and acute lymphatic leukæmia can only be made by the differential count of the leukocytes, as the clinical symptoms, physical signs, and the numerical count may be similar. It is often difficult to say whether the large mononuclear cell is to be classed among the large lymphocytes or the unripe myelocytes. A safe rule to follow, according to Billings and Capps, is this : When large mononuclear cells are seen with a considerable number of myelocytes of the same size, and when many of the mononuclears show indistinct granulations, they may be considered as myeloid cells.

In all of the recorded cases of acute myelogenic leukæmia there was difficulty in separating the large mononuclears and the myelocytes, because so many transitional cells with faint, indistinct granules were present. The large mononuclears never were less than 15 per cent., while the myelocytes varied from 8.6 per cent. to 60 per cent. The small mononuclear cells were relatively diminished. Eosinophiles were either absent, present in small number, or increased. Mast cells were seen in one case only. Nucleated red corpuscles did not form an essential part of the picture, as in the chronic myelogenic type.

Using the published cases as a basis, the blood picture of acute myelogenic leukæmia may be summed up as follows :

1. Anaemia, progressive and severe.
2. A large increase of white blood corpuscles (16,000 to 540,000).
3. A large proportion of the white cells (25 to 96 per cent.) made up of myelocytes, large mononuclear cells of the same size, and faintly granular large mononuclear cells (transitional cells).
4. Eosinophiles, mast cells, and nucleated red corpuscles may be absent or present in varying numbers.

A specially interesting case of acute myeloid leukæmia is reported by Turck,<sup>1</sup> in which there was a green coloration of the bone-marrow.

The case here reported, very briefly, occurred in a man who had previously been healthy. For six months he had shown increased pallor and hemorrhages from the gums. Then suddenly there came a rapid increase in the severity of the general condition. The examination

<sup>1</sup> Deutsche medicinische Wochenschrift, Vereins Beilage, No. 22, 1903.

showed, besides the ordinary manifestations of the anaemia, marked hemorrhages from the gums, some ecchymoses of the skin and conjunctivæ, and hemorrhagic neuro-retinitis, as well as a slight splenic tumor.

The blood examination showed 1,000,000 red cells without morphological changes, and 19 per cent. haemoglobin. The number of leukocytes was 40,000, with 47 per cent. myelocytes; 32 per cent. polynuclears and 15 per cent. lymphocytes.

The course of the disease was without fever, and, under signs of increasing anaemia, death occurred. The section showed, besides the anaemia and the capillary hemorrhages, as the most essential finding a diffuse regular grass-green coloration of the marrow in the vertebræ, ribs, sternum, and the proximal portion of both femora.

A smear preparation showed that the entire marrow was composed almost exclusively of neutrophile myelocytes and their transformation products. An anatomical diagnosis of myelogenous leukaemia was accordingly made. In the discussion on this case Sternberg recalled that a case of chloroma exhibited by him in the previous year showed an analogous blood finding. He believed that the finding in the bone-marrow in Türck's case, where smear preparations had been made, on this account might differ from those made by himself in which cut sections had been examined.

Türck in reply stated that in Sternberg's case the majority of the large mononuclear elements were those giant lymphocytes which occur in acute leukaemia and lymphosarcoma, and are difficult to distinguish from the non-granular myeloid cells.

Sternberg's case therefore presented a green lymphosarcoma, while Türck's presented a green myeloid hyperplasia. Sternberg, however, was inclined to think that the cases were related to each other.

These cases are of great interest in establishing the fact that we can no longer look upon acute leukaemia as being always lymphatic. Likewise it tends to strengthen the position of those who hold that all leukaemias are essentially diseases of the bone-marrow.

**LEUKAEMIA AND TUBERCULOSIS.** The association of these conditions is very unusual, and Susman<sup>1</sup> has endeavored to find a reason for the rarity. In order to establish the relative frequency of tuberculosis in leukaemia he examined the autopsy records, extending over a period of ten years, of five large English hospitals. He was able to find records of forty-one leukaemia cases, and in only one of these was there a complicating tuberculosis. Assuming this as a basis of calculation, we would expect to find in every hundred cases of leukaemia two of them

<sup>1</sup> Practitioner, October, 1903,

associated with tuberculosis. From the Registrar-General's reports it is usually stated that one death in every seven is due to tuberculosis, but Susman thinks this too high. In 7200 autopsies from all kinds of disease he found that 827 were due to or complicated with tuberculosis. From these figures it would appear that out of every hundred deaths of all kinds a complicating tuberculosis was causal in eleven or twelve. It is thus seen that in leukæmia there is a marked antagonism to tuberculosis, inasmuch as only one-fifth as many leukæmia cases show these complications as do other diseases. An analysis of the cases shows the following results :

*Sex.* Of the 21 cases in which it is mentioned 18 were males and 3 females. This result is very remarkable. While leukæmia affects the male sex more frequently than the female, the proportion is ordinarily only about two to one. There seems to be no difference in the susceptibility of the two sexes to tuberculosis, but when the two diseases, leukæmia and tuberculosis, are combined, the disproportion between the male and female is markedly increased, six males being affected to one female.

*Age.* With regard to age, 17 were between eighteen and fifty years; 2 were under eighteen and 2 over fifty years. The youngest was nine and the oldest fifty-eight years.

*Type of leukæmia.* In 5 cases the leukæmia was apparently of a splenomedullary type, and 2 other cases probably belonged to this type. In 17 cases the leukæmia was of the lymphatic type. The lymphatic type was therefore two and one-half times as common as the spleno-medullary. This, again, is contrary to what is found in uncomplicated cases of leukæmia.

*Precedence of tuberculosis or leukæmia.* These divide themselves into three classes :

Class A. The tubercle is obsolete. The advent of the leukæmia does not affect it.

Class B. The tubercle is old and latent, and the advent of the leukæmia sets it afame again.

Class C. The tubercle infections occur during the progress of the leukæmic disorder owing to the lessened resistance of the patient.

*Blood Changes Found in Combined Leukæmia and Tuberculosis.* The most noticeable point is that as the tuberculous process advances the distinctive character of the blood tends to be modified or is often lost. The point most often noted is a diminution in the number of leukocytes.

*Effect on the Duration of the Leukæmia.* This is difficult to determine, as the exact dates of onset of one disease or the other are impossible to obtain. From the post-mortem records it would appear that

while the tuberculous infection up to a certain point exercises an antagonistic influence on the leukæmia the resistance of the individual, and more particularly of the lymphatic system, is so undetermined by the leukæmic process that there is a tendency for the case to terminate by the supervention of an acute miliary tuberculosis. That the association of the two diseases is rare is proved by the figures quoted, and that when in combination they appear to exercise an antagonistic effect seems to be probable from the fall in the number of leukocytes and the diminution in the size of the spleen and the glands, when a tuberculous infection occurs in a leukæmic patient.

As a cause of this antagonism the author suggests the presence of a marked mononuclear leukocytosis, and believes it may act in the following way:

1. By increasing the amount of the nucleoalbumin present in the body.

2. By increasing the phagocytic action of the blood.

It would appear that :

1. Tuberculosis is rarely found in combination with either the splenomedullary or lymphatic form of leukæmia.

2. When the combination does occur it is two and a half times as common in the lymphatic as in the splenomedullary form.

3. It is six times as common in the male as in the female.

4. The tuberculosis may supervene as a terminal infection.

5. The tuberculosis may be found latent and obsolete.

6. The tuberculosis may be latent and be lighted up as the result of leukæmic infection.

7. This last is the condition most commonly found.

8. When the two diseases are combined there is a tendency for the total number of leukocytes to be diminished and the spleen and glands to decrease in size.

9. This antagonism is possibly due to the excess of nucleoalbumin and the increased phagocytic power of the blood, both of which conditions are present in the leukæmic patient.

**TREATMENT.** Some time ago it was suggested that a leukolytic serum might be employed to reduce the number of white cells in leukæmia. Lucatello and Malon<sup>1</sup> report their results with this serum therapy.

Rabbits and sheep were inoculated with leukocytes derived from patients with leukæmia. The blood after withdrawal was set aside to settle spontaneously which allowed the leukocytes to be collected free from red blood cells or serum. The rabbits thus received forty-seven

<sup>1</sup> *Gazetta degli Ospedali*, 1903, No. 11.

endoperitoneal injections of 5 to 10 grams of leukocytes in the course of thirty to forty-five days.

The sheep received nine injections in the external jugular vein at intervals of two to twelve days. The serum of the animals thus treated displayed *in vitro* marked destructive action on human leukocytes, and three patients with leukæmia were treated with it by subcutaneous injections of about 1 to 5 c.c. of this serum, usually on alternate days. One patient with 560,190 leukocytes before treatment received twenty-six injections, and the leukocytes then numbered 375,720 per mm. The enlarged spleen was also reduced in size during the serum treatment. The second patient was in a very advanced stage of the disease, and no benefit was apparent from the twenty-eight injections made. In the third case the leukocytes fell only 7660 from the original figure of 500,960 after all injections—a total of 42 c.c. of the serum in thirteen days. The proportion of the uric acid in the urine rose from 0.70 to 0.95, and the size of the spleen was very much reduced. The injections caused no by-effects in any instance, and were perfectly tolerated.

**Chronic Cyanotic Polycythaemia.** During the past year several cases have been reported in which the most striking features were a chronic cyanosis with high-grade polycythaemia, usually associated with the enlargement of the spleen. As the course, duration, and clinical features do not coincide with the usual conditions in which chronic cyanosis occurs an attempt is made to group them under the above heading.

The most complete list of cases is that of Collins,<sup>1</sup> who has been able to collect thirteen cases, including two of his own.

The majority have occurred within the middle period of life, one, however, being only twenty-four years of age (Collins), and one sixty-one years (Hall).<sup>2</sup> Six were females and seven males. Nothing of importance as bearing on the etiology could be obtained from the family history, nor was the previous history a help in explaining the causation. It is of interest, however, that two of Osler's<sup>3</sup> cases and one each reported by Hall and Collins occurred in Jews. The nationality is mentioned in only two of the remaining nine cases—one being an Irish girl, the other a German man. A brief résumé of several of the cases may be of interest in showing the clinical aspects of the symptom-complex.

**Case I.** Reported by Hall.<sup>4</sup> Mrs. M., a Jewess, aged sixty-one years, born in Germany, lived in Denver eighteen years. Family

<sup>1</sup> Medical Record, November 21, 1903.

<sup>2</sup> American Medicine, June 27, 1903.

<sup>3</sup> American Journal of the Medical Sciences, August, 1903.

<sup>4</sup> Loc. cit.

history good. Had borne six children. Menopause at fifty ; no serious illness ; no history of alcoholism, syphilis, or tuberculosis. Always well and strong until after menopause, when she began to complain of dyspnoea and palpitation, on account of which she consulted a physician. The condition gradually became worse during the past eight or ten years. She stated that she ate and slept well, had no pain, no constipation, but was always thirsty ; lips were tremulous. Dyspnoea was marked after the exertion of removing her clothing.

The most marked feature was a cyanosis of such intensity that her lips and tongue were of the color of a ripe Concord grape. The cyanosis was slightly less on the hands and still less on the trunk and extremities. Over the face tortuous veins were seen almost black in color and 2 mm. to 4 mm. in width. The fingers were not clubbed.

Height 5 feet, weight 160 pounds.

Her daughter stated that at certain times, especially after excitement, she showed a dusky flush. This was not noted during examination. The temperature was normal, pulse 84, respiration 30. When seated the pulse was strong and regular, with increased tension as compared with the normal. The arteries were moderately atheromatous. The heart was if anything slightly enlarged on percussion ; sounds all sharp and clear ; the aortic second sound moderately accentuated. The examination was unsatisfactory on account of obesity.

The lungs were negative except for a few crackles at the bases, probably oedematous, as the urine contained albumin and the legs were swollen. There was no evidence of anything severe.

The abdominal examination was difficult, owing to the thick walls. The spleen could not be felt, and there were no enlarged glands.

There was moderate oedema of the feet and legs, which had existed for years. Knee-jerks were normal.

Urine : 2000 c.c. in twenty-four hours ; 1012 ; albumin 5 per cent. by weight, with a moderate number of epithelial casts in centrifugated sediment ; but no hyaline casts.

The right pupil was slightly dilated, the eyes being otherwise normal. The blood was very dark in color and coagulated so rapidly that it could scarcely be removed from the tube. The red cells were 9,949,600 per c. cm., and normal in size and shape ; whites, 6500 ; haemoglobin (Fleischl), 170.

Collins does not believe that this case is typical, as the atheroma of the vessels, the manifestations in the kidneys and heart, the oedema of the lungs, and the dilated tortuous superficial bloodvessels of the face account for the cyanosis. Polycythaemia in such conditions is not infrequent.

In contrast to this, the oldest patient, may be given the case of

Collins,<sup>1</sup> occurring in an Irish girl, aged twenty-four years, and employed as a domestic.

She had always been well until she reached the age of twenty-one years, when she began to complain of a stitch in the left side, which came on at intervals and prevented deep breathing. The pain continued for about five weeks, during which time she was under treatment for neuralgia. About this time it was noted that her hands and face became reddish-purple in color and that this discoloration did not disappear.

There was no pain or swelling with it, and it seemed to have no relationship to the stitch in the side, except that the cyanosis came after the stitch. Besides, she complained of pain in the left shoulder and base of the skull and had syncopal attacks, during which consciousness was not entirely lost. The attacks had lately almost disappeared. At the onset of her symptoms she had frequent vomiting. Constipation has always been troublesome. Six months previous to the observations she had erysipelas of the left foot. She came under the author's observation complaining of weakness and pain in the left side. When seen the face was cyanosed as well as the hands and feet, the former to about an inch above the wrists. There was no oedema or pigmentation. The heart was apparently normal, as were the lungs. She had had no dyspnoea. The arteries were soft; the thyroid not enlarged. The spleen was greatly enlarged, reaching to three inches above the iliac crest. The liver was not enlarged.

Blood Examination : The red cells numbered 9,821,000 ; white cells, 17,800 ; haemoglobin, 110 per cent. A differential count showed the polynuclear and the transitionals to be 73 per cent. ; large and small mononuclears, 26 per cent. ; eosinophiles, 0.5 per cent. No myelocytes were present. The red cells were normal in size and shape, and none of them were nucleated. The drop of blood was almost black in color. The urine, though frequently examined, was always negative. Finally, a case of Osler's<sup>2</sup> may be mentioned. His patient was a physician, aged forty-four years, who had been somewhat cyanosed for years. The cyanosis was not especially marked, excepting the lips and feet and hands, to a less degree on the ears. Patient had always been constipated. He complained of a feeling of fulness in the head, with a sensation of vertigo at times. The pulse was at times rapid ; the blood pressure high (200 to 203 maximal pressure) ; the spleen was palpable, but not especially enlarged ; the urine contained a slight amount of albumin, with some hyaline and finely granular casts. There was no emphysema or cardiac symptoms.

<sup>1</sup> Loc. cit.

<sup>2</sup> Loc. cit.

Blood examination : Red cells, 9,952,000 ; white cells, 4000 ; haemoglobin, 120 per cent. (Fleischl). The literature of the remaining cases can be found in the articles of Collins<sup>1</sup>, and further citation of cases is not necessary.

The question as to whether these cases present a distinct clinical entity must remain open. The three cases quoted above present in common the cyanosis and the polycythaemia.

The majority have shown enlargement of the spleen, but this was not especially marked, except in the case of Collins. One case only, that of Vagues,<sup>2</sup> showed enlargement of the liver. Nearly all in which a urinary report was given showed slight albuminuria and complained of marked constipation. The features common to the group may be taken up in order :

1. Splenomegaly : Collins states that in the autopsies reported the spleen is the only organ found to be diseased, and seems inclined to think that the splenic enlargement, in his own case at least, is in some way related to the polycythaemia. Osler, however, finds it difficult to understand such a relation, though he mentions cases in which an enlarged spleen was the only cause found for a polycythaemia.

In a later publication the same author<sup>3</sup> has collected from the literature four cases of cyanosis with enlarged spleen in which, at autopsy, the spleen was found to be the seat of tuberculous changes. In some of these cases a polycythaemia was present. While these cases prove that primary splenic tuberculosis may be associated with cyanosis and polycythaemia, Osler thinks that the cases first reported are not due to this cause. In the three cases which came to autopsy no reports of caseous nodules in the spleen were made, and the duration (eight years in one instance) speaks against tuberculous infection.

2. Chronic cyanosis : This, as Osler says, is a very frequent clinical symptom and may be due to many causes. According to him, it may be due to organic diseases of the heart, particularly in congenital malformation, chronic myocardial and tricuspid lesions in children and adults, in some cases of adherent pericardium, in lung disease, as emphysema and fibroid phthisis, and in methaemoglobinæmia from chronic poisoning with coal-tar products. Cyanosis, according to Osler, means insufficient oxygenation, but in this special group of cases the cause is hard to find.

3. Polycythaemia : In the conditions above mentioned as being associated with chronic cyanosis, polycythaemia of the grade found in cases under discussion is said not to be met with.

<sup>1</sup> Loc. cit.

<sup>2</sup> Bulletin médicale, Paris, 1892.

<sup>3</sup> British Medical Journal, January 18, 1904.

The limit in heart cases is put by Cabot at 7,000,000, and Osler's belief is that the methæmoglobinæmia cases show a diminution in the red cells. These views cannot be absolutely accepted, for Fromherz<sup>1</sup> reports three cases of congenital heart disease in which the red cells numbered 8,000,000 or more, and in Cabot's case of chronic acetanilid poisoning, mentioned in last year's PROGRESSIVE MEDICINE, the red cells numbered 5,200,000 when first seen and 6,200,000 three days later.

Many explanations have been offered for the occurrence of polycythaemia, but the question still remains somewhat debatable.

The cases of the symptom-complex here discussed are too few to permit of conclusions. As has been seen, the characteristic features may occur in a great variety of conditions, some of which are difficult to exclude.

A consideration of the eye-grounds in chronic cyanotic polycythaemia will be found in Dr. Edward Jackson's article in this volume.

**Leukocytosis in Variola.** Ferguson<sup>2</sup> has made a series of examinations of the blood in sixteen cases of smallpox which are worthy of note. The cases included eight mild attacks characterized by a discrete eruption and running a normal course occurring in previously vaccinated individuals; three grave cases ushered in by severe prodromata and accompanied by an abundant semiconfluent eruption, but terminating favorably; five cases of the most severe type (confluent and hemorrhagic), four of which terminated fatally.

In the mildest cases the leukocytosis was not established until just before or at the time of the appearance of the eruption. It reached its maximum at about the eighth or ninth day (when the turbidity of the vesicles was most general), and then slowly declined to be interrupted by an increase if inflammatory or suppurative changes complicated the convalescence.

In the second group of cases the numerical leukocyte changes were of much the same character in important particulars. A high degree of leukocytosis may be maintained until later in the illness, when desiccation and crusting have become general.

Ferguson's finding in the third group of severe cases is somewhat at variance with the observations of other authors who have reported absence of leukocytic increase under such circumstances. In Ferguson's cases there was a moderate but transient leukocytosis, giving the impression that an attempt was made to follow the usual curve, but that the hæmatopoietic apparatus suddenly failed, causing an abrupt drop in the white cells before death.

<sup>1</sup> Münchener med. Woch., October 6, 1903.

<sup>2</sup> Journal of Pathology and Bacteriology, May, 1903.

The results of his differential counts show that the polymorphonuclear neutrophiles are relatively reduced, being frequently only 46 to 50 per cent., and in one case falling as low as 33 to 36 per cent. This relative reduction lasts for some time, until after the twentieth day of the illness. It must be remembered that the reduction is relative, absolutely the polymorphonuclear neutrophiles may be increased. In only four cases was there an absolute and relative increase of these cells, and this condition was transitory. This type of cells seems especially prone to the degenerative changes, which begin to show themselves usually about the eighth day or earlier.

The lymphocytes and smaller hyaline cells showed a marked increase, both absolute and relative. This increase is characteristic of variola, and occurs almost entirely at the expense of the polymorphonuclear neutrophiles. This increase, so great that these cells constitute as much as 50 to 66 per cent. of the entire number of leukoblasts, reaches its maximum about the eighth to tenth day, being later (the thirteenth day) in the more severe cases. In the most severe cases the increase, though present, is somewhat masked by the occurrence of the myelocytes in the blood.

The lymphocytes and the smaller hyaline cells show evidences of degeneration, but to a much less marked degree than the polymorphonuclear neutrophiles. The larger hyaline cells show fluctuation in the milder cases, at times being relatively reduced; in the more severe cases there is both a relative and absolute increase.

The eosinophile cells show an absolute and relative increase in the earlier stages of the disease, but later on undergo a distinct reduction. In severe cases the increase only makes its appearance shortly before the termination. Degenerative changes are less frequently marked.

The myelocyte was frequently met with, the number being dependent, apparently, on the severity of the case. In mild cases only a few were seen, but in the more severe ones the increase was so great that they equalled 10 to 12 per cent. of the total number of white cells.

Nucleated red cells were infrequently met with in the milder cases, but were oftener seen in the severe types of the disease. Ferguson believes that their occurrence is accidental, and that they are carried into the blood stream with the myelocytes. From his observations he concludes :

1. Variola, in all its manifestations, is accompanied by leukocytosis. This reaches its maximum on or about the ninth day of the disease, after which it slowly wanes or may later undergo an increase, due to complications. It is most notable in cases undergoing marked and generalized pustulation, and, although of moderate degree, is still present in transient fashion in the most severe cases.

2. The characteristic feature of the variolar leukocytosis is the relative and absolute increase of the smaller hyaline cells and lymphocytes by which it is accompanied—a condition associated regularly with a relative reduction of the polymorphonuclear neutrophile elements, though these, absolutely, are augmented.

This characteristic leukocytosis is maintained for a considerable time after the acute stage of the illness has passed.

3. In the more severe class of cases it is characterized by the presence in the blood of elements normally occurring in the bone-marrow, in numbers which are not often realized in other acute infectious diseases. These include, besides the mononuclear neutrophiles, neutrophiles of the transient type, mononuclear eosinophile cells, and nucleated red corpuscles of both varieties.

**Leukocytosis in Typhoid Fever.** In this respect the work of Türcck, Naegli, Thayer, and others has been our chief source of knowledge. From their observations it may be considered as definitely settled that in uncomplicated cases of typhoid fever the polymorphonuclear neutrophiles are relatively and absolutely decreased, while the large mononuclears are always relatively and usually absolutely increased. The small mononuclears are relatively and absolutely decreased, normal or increased, the eosinophiles being relatively and absolutely subnormal. It is generally supposed and stated that these peculiar relative variations are first manifest during the second week of the disease, from which time on they increase in intensity to a greater or less degree. This supposition is mainly based on the work of Thayer, since he is the only one who reports examinations during the first week of the disease. In twelve cases he found the following average figures: small mononuclears, 12.9 per cent.; large mononuclears, 12.4 per cent.; polymorphonuclear neutrophiles, 74 per cent.; eosinophiles, 0.5 per cent.

In this communication Thayer did not state the grounds upon which the diagnosis was made nor the facts which led him to suppose that the counts were really made in the first week of the disease. Furthermore, it may be mentioned that the counts were not made by Thayer individually, but by different internes of the Johns Hopkins Hospital, and, finally, that the total number of leukocytes counted in the different cases varied. Higley's<sup>1</sup> results differed greatly from those of Thayer, and have convinced him that in many instances the differential leukocyte count, which may be called characteristic of typhoid fever, is present during the first week of the disease.

The smears were stained by Ehrlich's, Jenner's, and Wright's stains. In all cases the full number of one thousand cells was counted on each smear.

<sup>1</sup> Medical Record, September 19, 1903.

Differential counts were made in sixteen cases of typhoid fever in the first week of the disease, the diagnosis being established subsequently to the count, as follows :

In seven cases by the isolation of typhoid bacilli from the feces, using the Hiss method ; in six cases by the presence of a positive Widal reaction (one to twenty or above) ; in three cases on a clinical basis, by the appearance of a typical typhoid roseola, an enlarged spleen, and a typical clincial course.

In these three cases the situation interfered with the carrying out of either the Widal or isolation test. While it is difficult to establish the exact date of onset of typhoid fever, the author has taken as his criterion the appearance of the eruption which Osler says occurs from the seventh to the tenth day. In nine of the cases the counts were made at least three days previous to the eruption. In these nine cases the average percentages of the various leukocytes were computed. The author utilized in this computation the counts made on specimens stained with Ehrlich's triacid stain. Counts made with Jenner's and Wright's stains showed only a variation of a fraction of a per cent. from the averages obtained from smears stained with Ehrlich's mixture.

The average proportions were as follows : Small mononuclears, 17.8 per cent. ; large mononuclears, 21.1 per cent. ; polymorphonuclear neutrophiles, 59.4 per cent. ; eosinophiles, 1.7 per cent. The highest and lowest percentages of the various leukocytes are as follows : small mononuclears, highest, 22.8 per cent., lowest, 12.8 per cent. ; large mononuclears, highest, 29.3 per cent., lowest, 12.1 per cent. ; polymorphonuclear neutrophiles, highest, 65.5 per cent., lowest, 49.1 per cent. ; eosinophiles, highest, 3 per cent., lowest, 0.8 per cent. In the seven remaining cases the author was unable to absolutely assure himself that they were in the first week of the disease. The percentages obtained were practically the same as in the nine cases preceding.

These figures when compared with those of Thayer, made in the first week of the disease, show that the relative number of polymorphonuclear neutrophiles is, in the average, much lower (14.6 per cent.), while that of the large mononuclears is much higher (8.7 per cent.). The small mononuclears and eosinophiles also show somewhat higher figures, but the marked decrease in the polymorphonuclear neutrophiles is principally due to the marked increase in the large mononuclears.

The author thinks that if his findings are correct the differential count of the leukocyte may be of value in distinguishing typhoid fever from the various acute diseases which show a normal leukocyte count as far as numbers are concerned. The chief ones are acute miliary tuberculosis and malaria.

In the latter disease the differential counts are often similar to those of typhoid, but in eight out of seventeen cases of malaria there was a relative increase of the polymorphonuclear neutrophiles, and the eosinophiles are fewer in number.

As the author states, the cases are too few and the possibility of error as to the exact date of the onset of the typhoid fever cases so great that the conclusion must be drawn with caution.

**Eosinophilia.** The occurrence of a rather marked increase of the eosinophile cells in the blood of those suffering from *hydatid cysts* has already been referred to in previous numbers of PROGRESSIVE MEDICINE, but the reports were so incomplete that a clear idea was not obtainable. Sabrazès<sup>1</sup> reports at length the observations made on seven cases of hydatid cyst occurring in adults. Two of the cases were diagnosed clinically, and the remaining five by puncture, extirpation, or by the expectoration of hooklets and skin-like pieces.

Six of the cases showed isolated cysts; four in the liver, one in the lung, and one under the aponeurosis of the left sartorius muscle in Scarpa's triangle; one case showed multiple cysts in the mesentery, spleen, and pancreas.

Complete blood counts were obtained in four instances. The first, a cyst of the liver in a man, showed a subnormal erythrocyte count, a leukocytosis with slight increase of the polynuclear cells, and distinct eosinophilia (1584 per c.cm., instead of the normal 180).

The second patient, a young girl, had a cyst on the left lobe of the liver. As a result of an exploratory puncture there occurred fever, traces of albumin in the urine, along with a distinct amount of indican and urobilin. During this febrile attack (which was not accompanied by urticaria) the eosinophiles did not exceed 1½ per cent. With subsidence of the temperature (the cyst remaining stationary) the blood showed a somewhat lower worth in red cells and a leukocytosis which affected all varieties of the white cells (except the larger mononuclears), but especially the eosinophiles, which amounted to 911 per c.cm.

This patient was completely healed by marsupialization.

The third case (multiple cysts) showed practically the same blood picture, excepting that the polynuclear neutrophile increase was more marked, while the eosinophile increase was less evident, though distinct (694 per c.cm.).

In the fourth case the cyst occurred in Scarpa's triangle, and had existed for fifteen years. The changes here were both proliferative and regressive. The character of the fluid being serous and cloudy gave rise to the belief that the condition was either a hygroma or an adeno-

<sup>1</sup> Münchener med. Woch., March 31, 1903.

lymphocele. The latter supposition was held for a time, but the microscopic examination of the cyst-contents, its content in eosinophile cells, and the presence of the Charcot crystals led to the conviction that it was due to the echinococcus.

The histological examination of the musculo connective tissue pocket surrounding the cyst, and the remarkable number of eosinophiles in this tissue, which enclosed the parasite concentrically with a layer over 1 cm. in thickness, threw a new light on the mechanism of the symptomatic eosinophilia in this affection.

One sees here a striking example of the positive chemotaxis on the part of the echinococcus toward the eosinophile cells. The intensity of the local, migratory, and proliferative eosinophilia is much greater than that shown in the circulating blood. The attractive power of the parasite and its secretion for the eosinophilia, aided by ruptures in the cyst wall, brought about the entrance of these cells into the cyst interior.

In two other cases of hydatid cyst of the liver the eosinophiles numbered 11.81 per cent. and 17 per cent., respectively, while a third showed 4.4 per cent. In none of these cases were changes found in the red cells. No poikilocytosis, polychromasis, nucleated red cells, or cells with basophilic granules could be seen.

In four of the cases in which the leukocytosis was given they showed 11,160 and 15,500 in two cases of the liver cyst; 17,600 in the patient with multiple cysts, and 5580 in the case of the cyst of Scarpa's triangle.

In the leukocytosis the eosinophiles were always affected, the percentage at times being over fourteen times the normal, and the absolute worth per c.mm. may be nine to ten times the physiological average.

In four cases the polynuclear neutrophiles and the lymphocytes were increased in three, the large mononuclears in two, and the transitional forms in one.

Mastzellen were never observed, and the iodine reaction was always negative.

In unopened cysts and after aseptic puncture which was not followed by local or general disturbance, and in cases in which the cyst was unopened or when aseptic puncture produced no local or general disturbance, there was generally marked eosinophilia. One case, in which fever followed puncture, showed diminution of eosinophiles, which later increased (see above).

In a case of suppurating hydatid cyst of the liver an increase of eosinophiles was noted, but it was of slight degree.

Since these results are different from those found in cases clinically resembling hydatid disease a certain amount of weight is to be attributed

to them. Interesting as these observations undoubtedly are, the matter can scarcely be considered as explained by the finding of local eosinophilia, for in other conditions associated with local eosinophilic infiltration a circulatory eosinophilia has not been found. Thus Weir<sup>1</sup> quotes Howard and Perkins as finding local eosinophilic infiltration in tissues obtained from various parts of the body, as spleen, liver, stomach, intestines, heart, lungs, thymus, lymph gland, etc., from which they concluded that the eosinophiles took an active part in many inflammatory processes.

Weir's own observations were directed toward the occurrence of eosinophilia in *pelvic lesions* and *the appendix*. In all he examined 500 specimens, but as 261 had been hardened in alcohol the presence of the eosinophiles could not be determined, as this method of preservation interferes with the staining. Of the remaining 239 cases, in which proper fixing agents had been employed, 145 showed a more or less marked grade of eosinophilic infiltration. In spite of these findings, locally, no increase in acid-staining white cells was noted in the circulating blood.

The association of *circulatory eosinophilia with diseases of the genitalia* was formerly insisted upon, but this is only present in certain conditions. The conclusions of Vosswinkel (quoted by Weir) show the results obtained from a large number of examinations, and may be given here :

1. A circulatory eosinophilia is absent in disease of the tube alone. In pus cases there may be an increase in the polymorphonuclear neutrophiles, but no myelocytes are found. In thirty cases of fibromyomata a circulatory eosinophilia did not occur, nor was it noted in twenty-three cases of endometritis. In both of these latter conditions, however, a leukocytosis may occur.

2. In all severe diseases of the ovary, with fever, except carcinoma of the ovary, there is a circulatory eosinophilia.

3. In carcinoma of the uterus the eosinophiles in the blood may be increased, normal, or decreased, there being no difference between mild and severe cases.

4. In the majority (ten out of eighteen) of the cases of large ovarian cysts and suppuration of the ovary causing extensive degeneration there is a circulatory eosinophilia, and myelocytes are also found.

Weir made only a few observations on the eosinophiles in the blood, but found that an increase to more than 4 per cent. was exceptional. His deductions are worth recording :

1. Eosinophiles take a prominent part in the cellular infiltration associated with inflammatory and suppurative processes of the pelvic organs.

<sup>1</sup> American Journal of the Medical Sciences, January, 1903.

2. In such conditions they are usually found in the largest numbers in the subacute stage and associated with connective-tissue hyperplasia.

3. Eosinophilic infiltration is found in most cases of carcinoma of the cervix and in almost all cases of pyosalpinx and ovarian abscesses.

4. In inflammatory conditions of the endometrium eosinophiles occur in small numbers and in but few cases.

5. Eosinophiles represent a large proportion of cells forming the stroma of the mucosa in the normal and the diseased appendix.

6. In inflammatory conditions of the pelvic organs associated with an eosinophilic infiltration of the tissues, the percentage of eosinophiles in the circulating blood is rarely increased and usually decreased.

From the above it is plain that many inflammations are accompanied by local increase of eosinophiles, and it might be thought that in Sabrazé's case the local increase of eosinophiles was rather the result of a fifteen-year-old inflammation than of a special action on the part of the parasite.

The whole subject needs further study, and it is strange that no attempt has been made to produce an eosinophilia by injecting an extract of the parasite.

Finally may be mentioned a case of *anchylostomiasis* recorded by Stockman,<sup>1</sup> in which the eosinophilia reached the enormous proportion of 43 per cent.

This patient (seen in Scotland) dated his illness from an attack which occurred two years previous in India. When seen the blood count showed red cells, 3,200,000; white cells, 9000; eosinophilia as above; haemoglobin, 28 per cent.

Numerous ova were found in the feces. Under treatment with thymol to remove the parasite, and later on the use of arsenic and iron, the recovery was prompt and complete.

**Iodophilia.** The growing interest in this reaction of the leukocytes to iodine has led to numerous publications as to the conditions under which it may occur and its importance as an aid to diagnosis. Generally conceded to be an evidence of degeneration of the white cell, the discrepancies in the reports of different observers lead to the belief that there must be some defect in technique or that the reaction can occur from causes as yet unknown. Of the articles appearing during the past year may be mentioned those of Sorochowitsch,<sup>2</sup> Dunn,<sup>3</sup> Wolff,<sup>4</sup> Locke.<sup>5</sup>

<sup>1</sup> British Medical Journal, July 25, 1903.

<sup>2</sup> Zeitschrift f. klinische Medicin, Bd. li., Heft 3 und 4.

<sup>3</sup> Boston Medical and Surgical Journal, November 5, 1903.

<sup>4</sup> Zeitschrift f. klinische Medicin, Bd. li., Heft 5 und 6.

<sup>5</sup> Boston Medical and Surgical Journal, September 11, 1902.

Wolff recommends the method advised by Zollikofer, exposure of the still moist smear to the vapor from crystals of pure iodine in an air-tight vessel. The reaction by this method is much more sensitive, though it requires more time. Many other methods are employed, the most popular being the solution of iodine and potassium iodide in gum arabic. Concerning the cells in which the reaction may be found, there is also a difference of opinion. While all are agreed to its occurrence in the polynuclear cells, some observers claim that the reaction is not seen in the mononuclear leukocytes, and only one observer (Zollikofer) has reported finding it in the eosinophiles.

The probable method of origin of the *glycogen granules* is the subject of some discussion.

Sorochowitsch explains it as follows : Glycogen is present in every cell, but partially in combination with the albumin molecule. The free glycogen, the portion which the cell can give up, arises from the nutrition brought to the cell or from the albumin compound. Normally this free glycogen by the action of a ferment, is transformed into glycose, which in turn is burned up into  $\text{CO}_2$  and  $\text{H}_2\text{O}$ , which are excreted as end products. If now, from any cause, this ferment is injured or destroyed, the transformation of the glycogen into glycose ceases, and in the cell, still able to take up or produce glycogen, a heaping up of the latter occurs, resulting in the reaction to the iodine stain.

Somewhat on the same order is the explanation of Wolff. According to this observer the glycogen granules are always present in the leukocytes, but are not demonstrable by the ordinary stain, owing to their excessive solubility in water. When from any cause the solubility is diminished the reaction appears in the specimen examined. The conclusions of Wolff's paper will explain his theories on this subject :

1. The foundation for the numerous glycogen theories was the hitherto undisputed view that leukocytes circulating in the vascular system were free from glycogen.
2. It is now evident, however, that glycogen belongs to the normal composition of the leukocytes.
3. The determination of glycogen in the normal leukocytes demands a special method first employed by Zollikofer. The principle of this consists in the immediate action of iodine vapor on the still moist preparation. Perhaps one could designate this method more correctly as a "vital iodine fixation method."
4. The glycogen of the normal leukocytes is extremely soluble in water, and for this reason it is not demonstrable by the methods hitherto generally employed.
5. The "vital iodine fixation method" does not give an artificial

product that can be attributed to a purely physical heaping-up of the iodine.

6. The solubility of the glycogen in water varies in a different species of animals. In the leukocytes of a mouse it has not been possible to hitherto demonstrate glycogen. This arises in all probability from a maximal solubility in water, since the solubility of the glycogen of the frog's leukocytes is almost equally great.

7. The solubility of the leukocytic glycogen varies in most species of animals. It is diminished by emigration of the leukocytes from the vessels and by infectious processes, so that the glycogen becomes demonstrable by the old methods.

8. The old opinion that the mere findings of glycogen in the leukocytes speaks, for a degenerative change can no longer be held.

9. This opinion, however, referred only to the glycogen demonstrable by the old method. For this glycogen the proofs advanced of degenerative nature have not lost in power.

The new formula must therefore read :

10. If the glycogen present in the leukocytes so changes that it becomes less soluble in water the condition may be looked upon as a degenerative change which has affected the leukocytes.

These explanations, while very plausible, must, of course, be subjected to further study before they can be accepted. They offer, however, a possible explanation of the variations found in different animals used experimentally.

According to the location the glycogen particles have been classified as *intracellular* and *extracellular*.

Concerning the latter, Sorochowitsch is of the opinion that many reported instances are due to defects in technique, as he himself has never been able to find the typical mahogany-brown coloration extracellular except in pure pus, when it probably represented portions of disintegrated cells. Granules staining a brownish color he has frequently met with, but these were never typical, and were to be considered as artefacts.

Locke believes that in many instances the extracellular granules staining with iodine occur in the blood plaques, but he does not attribute much importance to the finding.

As to the intensity of the reaction the classification of Kaminer as advised by Sorochowitsch seems to be the most satisfactory.

1. Stage of diffuse " browning."
2. Stage of circumscribed granulation.
3. Stage of complete metamorphosis.

In this, as in all other reactions, the intensity may vary through all degrees, making the recognition at times difficult.

In taking up the question of clinical finding and the diagnostic worth we find that, as in all laboratory examinations, the reaction is not pathognomonic of any special condition, but when taken in conjunction with the other findings in the case may be of considerable aid to diagnosis.

According to Locke, the reaction has both a positive and a negative value as a diagnostic sign. Thus *septic conditions* of all kinds, including septicæmia, abscesses and local sepsis, except in the earliest stages, appendicitis accompanied by abscess formation or peritonitis, general peritonitis, empyema, pneumonia, pyonephrosis, tonsillitis, gonorrhœal arthritis and hernia, or acute intestinal obstruction where the bowel has become gangrenous, have invariably given a positive iodophilia, and by its absence all these cases can be ruled out in diagnosis.

The disappearance of the glycogen granules in the leukocytes in from twenty-four to forty-eight hours, following crisis, with frank resolution in *pneumonia* and the thorough drainage of pus in *septic cases*, is of importance. The persistence of the reaction in *pneumonia* would point strongly to delayed resolution in the former instance and to sufficient drainage in the latter.

In very severe *septic infection*, so severe that the usual increase of leukocytes has failed to appear, Locke has always found the reaction present, and therefore he believed it to be a more reliable indicator of the intensity of infection than the number of leukocytes.

Locke has also found that the reaction does not occur in serous pleurisy, but is positive in *empyema*, and mentions several cases in which, though the leukocytes were increased, the absence of iodophilia correctly indicated the absence of pus.

Sorochowitsch is by no means so enthusiastic concerning the iodine reaction as a diagnostic sign. The belief of various writers that iodophilia may be taken as an evidence of suppuration providing pneumonia can be excluded, Sorochowitsch does not accept, for, besides these conditions, he has found the reaction positive in coprostasis, small circumscribed carcinomata and in certain intoxications accompanied by local pain. The reaction is only of value when taken in conjunction with the other physical signs.

This observer, too, has found positive iodophilia in serous pleurisy and in cases of chronic morphinism. In true blood diseases he believes it is of no value, either diagnostically or as an aid to prognosis. The reaction is positive in gonorrhœal arthritis, but absent in acute articular rheumatism, an observation already recorded by Locke.

**IODOPHILIA IN CHILDREN.** Dunn's investigations were made on children by the method advised by Locke. As the reports of the reaction in children have been few these are given somewhat *in extenso*.

This author has estimated the percentage of cells showing the iodophilia, but has made no record of the percentage of the individual cells affected.

In twenty-two cases of *lobar pneumonia* iodophilia of a high grade of intensity was found, together with a correspondingly high percentage of reacting leukocytes, averaging 70 per cent. of the whole cells counted. After the crisis the reaction disappeared in all cases by the fifth day. In one instance they disappeared within twelve hours. In cases of delayed resolution the iodine reaction may persist longer, even to the fifteenth day.

In eight cases of *bronchopneumonia* iodophilia was found in every instance, the average percentage of affected leukocytes being slightly lower. In these cases it was difficult to determine the exact day of the disease. In four cases of influenza pneumonia the iodophilia reaction was present to the same degree as in the other forms of pneumonia.

In *typhoid fever* the reaction was positive at some stage of the disease in nine cases out of ten. In one case it was absent on the third day, but was present on the eighth day. The number of cells affected was under 50 per cent., while the intensity of the reaction was not marked, excepting in two cases complicated by septic processes. The reaction persisted as long as seventeen days after the temperature had reached normal.

In *cerebrospinal meningitis* the reaction was present in the five cases examined; the intensity and percentage of cells affected apparently show a correspondence with the severity of the symptoms. Observations made in the course of the disease seemed to show that the reaction disappeared in cases where the active process, as evidenced by fever, subsides, even in the chronic cases where the child remains unconscious, but that the reaction persists in those cases where there are relapses.

In eight cases of *acute miliary tuberculosis* the reaction was present in six. The percentage of cells affected varied between 30 and 66 per cent., the intensity being about average. Leukocytosis was absent in five cases and present in two.

Five cases of acute and two of a chronic type of *nephritis* were examined. The reaction was present in the severe acute cases and absent in the mild and chronic cases.

In three cases of pleurisy with serous effusion the reaction was absent, while in four cases of *empyema* the reaction was present.

In seventeen cases of functional indigestion, including twelve cases in early infancy (the so-called feeding cases), and five cases in middle childhood, the iodine reaction was absent in every instance. None of these cases showed leukocytosis.

A number of other children suffering from diseased conditions were examined. His summary is as follows :

1. The reaction is always present, usually of average and often of marked intensity, a high percentage of cells being affected in the following conditions :

Lobar pneumonia, bronchopneumonia, cerebrospinal meningitis, influenza (see above), empyema, suppuration (non-tubercular), and was found present in single cases of appendicitis, diphtheria, and starvation.

2. The reaction is usually present, but may be absent in cases of typhoid fever and miliary tuberculosis.

3. The reaction may be present or absent in anaemia.

4. The reaction is usually absent, but may be present in nephritis, cardiac valvular diseases, and tuberculosis.

**The Erythrocytes.** The major portion of the observations made on the variations in the red blood cell have been directed to a study of the so-called basophilic granules. As has previously been stated in PROGRESSIVE MEDICINE, there are two views concerning the origin of these bodies. Grawitz, who first investigated the phenomena, considers that the appearance of these granules must be taken as an evidence of red-cell degeneration. This view has been borne out by the results of my own observations as well as by the studies of many others, all of which have been thoroughly discussed.

The second view looks upon the basophilic granules as an evidence of blood regeneration, the granulation marking one of the stages in process by which erythrocytes get rid of the nucleus. Schmidt, Jawein, and, more recently, Vaugn<sup>1</sup> support this conception.

The latter author has recently published a series of investigations in which the blood cells were stained without being subjected to any form of fixation, believing that only in this way could errors be avoided and a true picture obtained.

The method of procedure was as follows : The surface from which the blood was obtained was thoroughly cleansed by washing with alcohol. The blood was then drawn, the first drop being used as an index as to whether a free flow has been obtained. This was then wiped off with a clean towel, and a drop of the previously filtered stain placed over the puncture by means of a pipette. The blood flowing from the wound thus mixes with the stain without coming in contact with the air, and the small drop thus obtained is immediately collected on a coverslip and placed at once on a slide, where, if the drop is not too large and the slide and cover are clean, it spreads out into a film and may be examined at once. He found that the use of a warm slide

<sup>1</sup> Journal of Medical Research, December, 1903.

and coverslip and a warm stage were not necessary. The stain used was in almost all instances Unna's polychrome methylene blue as prepared by Gruebler.

The stain was undiluted, and the best results were obtained when the drop of stain was small as compared with the drop of blood. While the solution used was not isotonic, the red cells showed no evidence of crenation or of swelling. In those instances in which changes were noted the specimen was immediately discarded and a fresh one made. On examination of a spread prepared in the above manner, it will be seen that at the end of a few seconds, although the majority of the cells show no affinity whatever for the stain, here and there throughout the specimen will be found a cell which contains more or less numerous granules staining a decided reddish-purple, having evidently shown a decided affinity for the methylene azure, the chromatin-staining principle of the polychrome methylene blue. The granules are usually found in cells whose haemoglobin seems to be normal, and are not more numerous in cells showing endoglobular degeneration, crenation, or other evidence of departure from the normal. The above-mentioned granules are of a decidedly pinkish appearance, which, after a lapse of some time, changes through a purple to a pronounced bluish tinge. The size varies greatly. In normal blood the granules are arranged either around the periphery or diffusely; differing in size, the granules also differ greatly in shape.

The author first studied the red cells in the normal individuals to learn if these granules were present in health and to obtain a basis for comparison. In each instance 1500 to 2000 cells were enumerated and the percentage showing basophilic granulation calculated. Of the eight individuals examined all showed four and one-half million or more red cells and a haemoglobin percentage of 90 or over. Basophilic granulation was found in each instance, varying from 0.5 per cent. to 1.8 per cent. of the cells counted.

The very narrow limits between the percentages of cells showing granules in the above cases is one of the most striking points in favor of the fact that here we are not dealing with artefacts or with cells showing degenerate changes. No increase in the per cent. of the granular cells was noted on allowing the specimen to stand, which also speaks against degeneration. The effects of different reagents were noted on the unfixed specimen. After staining, a  $\frac{1}{2}$  per cent. solution of acetic acid was allowed to flow under the edge of the coverslip. This brought about a gradual loss in the characteristic haemoglobin color of the red cells and its ultimate disappearance. The reddish-purple granules became changed to a decided blue from contact with the acid, and were brought out with much greater distinctness as the

remainder of the cell disappeared. For a time the granules kept closely together within the disintegrating cell, but finally separated, showing the complete solution of the cell, and from this time could not be differentiated from the detritus and precipitates of the stain which might be present. The nuclei of the white cell and the blood plates reacted in a similar manner to the action of the acetic acid.

Another specimen was prepared in the same way and subjected to the action of a haemolytic serum. The results obtained were practically identical with those of the preceding experiment. The granules were not dissolved by the action of the serum, but were apparently set free in the plasma, as the red cells containing them suffered haemolysis. The haemolytic serum had no effect upon the nuclei of the nucleated red cells nor upon the blood plates.

Nine specimens were examined from three cases of *pernicious anaemia* at times when the blood count ranged from 974,000, to 3,500,000; the haemoglobin from 22 to 78 per cent. The percentage of cells showing granules ranged from 7.7 to 18.8 per cent. Besides the marked increase in the percentage of granule-containing cells, changes were noted in the size and arrangement of the granules within the cells. In pernicious anaemia the granules are more apt to be massed together in the central portion, while the size, as a rule, is much larger.

A close relation was noted between the number of nucleated reds and the granular cells. During the blood crises the number of granular cells was increased enormously, and during the gradual failure, when the nucleated reds had fallen to 12 per 500 leukocytes, the granular cells also reached their lowest per cent. An examination of this table led the author to the supposition that these granules probably stand in some intimate relation to the nucleus of the red cell, and with this idea in view he examined the blood obtained from infants as soon as possible after birth.

Six children were examined, averaging in age from two hours to six days. One was examined who was born at seven months. In all cases an increased percentage of cells showing granulation was noted, as compared with the cells of a normal adult. A premature baby showed a percentage of 7 per cent., which was reduced to 3 per cent. after four days in an incubator. A child sixteen hours old showed a percentage of 4, while the same child six days later showed a percentage of 0.9. In all these cases the arrangement of the granules was for the greater part in the central portion of the cells. It is interesting to note with what rapidity after birth the blood of an infant assumes the picture characteristic of the normal adult life. In one instance the percentage of the granular cells was rapidly reduced after birth, but the arrangement of the granules was changed, being more to the periphery.

A large number of cases were examined, such as pneumonia, chorea, rheumatism, cancer of the stomach, myocarditis, endocarditis, etc., but no especial variation from the blood of the apparently normal individual was found. Specimens of bone-marrow obtained from autopsy cases were also examined, by allowing an unfixed smear to come into direct contact with the stain. In these cases the percentage of granular cells seemed to be about 3 per cent., a larger per cent. than is found usually in the normal circulating blood and about the same as that obtained in the blood of newly born infants. Owing to the many particles of granular débris in these cases, some of which it is exceedingly hard to differentiate from the granules within the cells, no stress can be laid upon the results. Specimens from the embryo of a pig were also examined. In a pig embryo the length of which was three and one-half inches granular nucleated red cells were present, showing a blue stain with an almost homogeneous nucleus, around and in which were scattered numerous fine pinkish-staining granules. In these granular cells the arrangement of the granules was for the greater part in the central portion, and many of them showed in addition numerous delicate, reddish-staining nucleoli. Cells showing diffusely scattered granules throughout were present in far less proportion than those showing the central arrangement. A drop of blood obtained from a goose was also stained. Many cells were found in which the nucleus appeared to be in a perfectly normal condition. The nuclear membrane in these cases was very distinct, and the chromatin network sharply defined, the whole staining a deep purple, thus showing that the structure of which it was composed contained elements for the chromatin-staining principle, the methylene azure, and for the methylene blue as well. In cells with a nucleus of this description granules were never seen in the haemoglobin-containing protoplasm. Certain other cells in which the outlines of the nuclear membrane were less distinct, although the entire nucleus still took a purple stain, showed granules in the immediate neighborhood of the nucleus which stained a decided pink, thus showing an affinity solely for the methylene azure. As the nuclear membrane and network became more indistinct they showed less and less affinity for methylene azure, staining decidedly more bluish, while the number of pinkish-staining granules in the protoplasm of the cell showed a proportionate increase.

The author believes that this represents a phenomenon in the degeneration of the nucleus. As it died the chromatin was cast off into the protoplasm in the form of granules.

Identical changes were seen in the blood obtained from a pigeon. The granules, however, were finer in structure, and the chromatin-containing nucleoli much smaller. The author believes that methylene

green should be considered as a weak nuclear stain, and as such it is of no value in following changes which represent a disintegration of the nucleus. Cases in which basophilic granules are found in nucleated cells, the nucleus of which is to all appearances intact, have been thought to speak against the nuclear origin of the granules. In such instances they may simply represent the chromatin granules which have just begun to be cast off from the disintegrating nucleus.

NATURE AND CLINICAL SIGNIFICANCE OF THE GRANULES. Vaughn believes that they are not artefacts from the fact that they did not increase in number on standing and that the percentage of the granule-containing cells in the normal individual and in those suffering from diseases in which the blood is not altered is practically constant. Their appearance is not due to alteration in the haemoglobin content of the cells, since they are most abundant in cells containing haemoglobin in equal distribution. All experimental evidence obtained points to their origin as being from a nucleus which has disappeared either through karyorrhexis or karyolysis. Thus, they are seen in the greatest abundance in those cases in which the nucleated red cells are also seen in the circulation, namely, in the blood of pernicious anaemia and that of newly-born infants. The fact that in this case they occupy more nearly the central portion of the cell, the original site of the nucleus, speaks for their nuclear origin.

From a diagnostic standpoint they have the same value within certain limits as can be given to the finding of nucleated red corpuscles. The increase in the number of such cells may be noted before the discovery of the nucleated cells themselves. The increase of granular cells to 9 or 10 per cent. would indicate a marked departure from the normal. As to prognosis, this would depend upon the condition in which they occurred. For example, in cases of secondary anaemia a high percentage of granular cells should be looked upon as a favorable sign, indicating a state of blood regeneration, whereas in a case of pernicious anaemia this would be valued at practically nothing.

Schmidt<sup>1</sup> reiterates his belief that *basophilic granulations*, as well as *polychromatophilia*, are evidences of blood regeneration representing younger forms of the red cell. That the change does not arise from a degeneration of the haemoglobin he tries to prove by the following experiment : A rabbit was injected with phenylhydrazin and, after demonstrating the presence of the chemical in the circulation, the ear of the rabbit was double clamped, to shut it off from the general circulation, and a wet dressing applied to prevent drying. After about eighteen hours blood both from the general circulation and from the

<sup>1</sup> Münchener med. Wochenschrift, March 31, 1903.

clamped-off ear was examined for granules. These were present in the circulating blood, but absent in the blood obtained from the ear. This experiment, Schmidt believes, is a proof that a haemoglobin degeneration does not produce the basophilic granules.

In one rabbit, after injection with 0.02 gm. phenylhydrazin, it was found that almost all the red cells containing basophilic granules were nucleated and, with few exceptions, all the nucleated cells showed this change. At the same time the polychromatophilia had increased. Schmidt makes no distinction between the large and small granules, believing them to be of the same nature.

The polychromatic staining he believes to be the result of a mixture of dissolved nuclear substance with haemoglobin. This can occur directly, or the stage of basophilic granulations may intervene.

This he proves by injecting an animal the blood from which shows marked basophilia, with large quantities of acid, as "Weinsaure" or hydrochloric acid, the result being that after three hours a marked diminution in the basophilia is demonstrable, while a distinct increase in the polychromasia appear. He thinks that this change is brought about by solution of the basic granules. Schmidt is opposed to the conclusions reached by Grawitz concerning the basophilia resulting from the ingestion of artificial haemoglobin compounds or after intestinal hemorrhages.

Grawitz thought that in these cases a poison was formed which produced the granulation, and was more convinced of this by the fact that in peripheral hemorrhages he found no basophilia.

Schmidt attributes the granulation to regeneration of the blood, and reports a case of peripheral hemorrhage which shows similar changes.

The patient showed a marked traumatic anaemia due to the loss of blood from a complicated fracture.

The blood examination on the day of injury showed no abnormality. On the sixth day of convalescence numerous polychromatic red cells and cells showing basophilic granules appeared in the blood, the latter still being present three weeks after the injury. The author thinks these phenomena cannot be looked upon as degenerative, as during the period mentioned the haemoglobin had increased from 50 to 75 per cent. (Gowers).

**DEGENERATION OF THE ERYTHROCYTE.** From a study of the degeneration of the erythrocyte J. C. Da Costa, Jr.,<sup>1</sup> draws the following deductions for clinical application :

1. The viscosity of the erythrocytes is influenced by cellular and plasma alterations, the nature of which is obscure. The viscosity is

<sup>1</sup> American Medicine, April 11, 1903.

exaggerated by the direct influence of various toxic agencies, and is diminished in many anaemic states. This phase of cellular pathology is interesting from an experimental point of view rather than as a finding of clinical application.

2. Simple decoloration illustrates the earliest retrograde change affecting the erythrocytes, and its intensity generally corresponds to the severity of the anaemic process by which it is excited. The change may exist alone, as in the milder forms of anaemia, or it may be combined with graver necrotic degeneration of the cells in anaemias of greater severity.

3. Deformities of shape and size are common to all pathologic blood, the degrees to which such change develops being related to the intensity of the blood impoverishment. Megalocytosis is a more serious sign than macrocytosis.

4. Atypical staining of the erythrocyte betrays an impairment of function, and, as a rule, is found most commonly in corpuscles in which the haemoglobin content is subnormal. It is most striking in anaemia of the primary type.

5. The prevalence of megaloblasts indicates a fetal reversion of the bone-marrow, and stamps the blood change as pernicious, except in the anaemia symptomatic of the bothriocephalus latus infection and of nitrobenzol poisoning. The presence of megaloblasts indicates a severe anaemia, but not necessarily one of fatal outcome.

6. Granular basophilia, whatever may be its exact origin, should be interpreted as a sign of degeneration. It is a constant blood finding in but a single condition—lead poisoning—but it is associated with many diseases involving a variable degree of blood deterioration. The experimental basophilia excited by the administration of preparations of haemoglobin warrants a doubt as to the wisdom of using such medicaments as a substitute for iron in the treatment of anaemia.

**Alkalinity of the Blood.** Orlowsky<sup>1</sup> has attempted to find the cause of the variations in the results obtained when determining the blood alkalinity by the Landois-Jaksch method. Having convinced himself that defibrination of the blood caused no change in the alkalinity, he took some defibrinated dog's blood and determined its alkalinity at different times, first according to Löwy and then according to Landois-Jaksch. Knowing the alkalinity of the serum he could easily reckon which proportion of its alkalinity in any given moment was due to the alkali of the destroyed red cells. In each experiment he determined beforehand the number of red cells in the cubic millimetre and their resistance, according to the method of Hamburger

<sup>1</sup> Deutsche med. Wochenschrift, August 20, 1903.

In his determination he laid especial stress on the following considerations :

Granted that the assertion of Löwy that the change in the blood alkalinity, according to the method of Jaksch, is dependent upon the destruction of the red cells is correct, then, naturally, the variations will be less marked the more resistant the blood is in the given case. On the other hand, must the variations in the blood alkalinity in the two portions of the blood by similar resistance in the blood cells be greater in that portion which is more rich in red corpuscles. When, therefore, in two different portions of blood from two animals we reckon the alkalinity of the blood, which in the given case comes from the portion of the red cells present, and when we trace the figure obtained to the similar content in the red cells in the two portions, we obtain figures that stand in the same relationship to each other as the resistance of the red cells in the two portions of the blood. A number of experiments has verified these assumptions. In this manner we see that the gradual increase in the blood alkalinity which proceeds spontaneously in the estimation, according to Landois-Jaksch, stands in a certain relationship to the resistance of the blood. Since the latter varies greatly, not only in pathological conditions, but also in different healthy individuals, the method of Landois-Jaksch gives no results which permit of comparison. If, however, this method is employed it must be remembered that the determination should not be made as rapidly as possible, the advice of Jaksch, but, on the contrary, one should wait at least one-half hour, as by doing so a greater portion of the blood alkalinity can be determined, namely, 87 to 97 per cent.

The method which the author has employed differs distinctly from those of Löwy and others. In spite of the fact that it is very complicated, it answers the purpose better, since one is able at every instant to follow the changes in the degree of the blood alkalinity according to the method of Landois-Jaksch, as well as the dependency of the same on the resistance of the blood and on its content of red blood cells. The author examined a number of patients, sixty-three in all. He determined the alkalinity of the blood by means of the alkalimeter of Engel. He likewise in each case determined also the haemoglobin content and the number of red and white cells. His results are as follows:

1. The alkalimeter of Engel gives results that are in excess of the actual alkalinity by 106.6 mg. NaOH to 100 c.c. blood when lacmus is employed as an indicator; if lacmoid is used the difference amounts to 119 mg. NaOH.

2. The alkalinity of the blood in healthy persons amounts to 240 to 267 mg. of NaOH to the 100 c.c. of the blood when lacmus is employed as an indicator; 269 to 289 mg. when lacmoid is used.

3. In the different diseases the blood alkalinity is proportionate to the red blood cell content. It is less by diminished content of red cells, and remains normal when the content is normal.

4. In view of this, determination of the blood alkalinity alone does not allow a correct idea as to the cause of its deviation from the normal.

5. One can only assume a heaping-up of acid products in the blood in consequence of an acid autointoxication of the organism, when, with a normal number of red cells, the blood alkalinity is diminished, or in case the diminution in alkalinity is much more strongly marked than the diminution in the red cells.

6. A disproportion which allowed the possibility of assuming an acid autointoxication of the body I have hitherto seen only in severe diabetes mellitus and carcinomatous cachexia.

7. Small tepid ( $37.5^{\circ}$  C.) alkaline enemata elevate the degree of the blood alkalinity to a more marked degree than the internal use of alkalies. This is seen both in the healthy and the diseased individual.

8. The artificial elevation of the blood alkalescence produced by the internal administration of an alkaline or the use of alkaline enemata lasts only a short time.

**Methods for the Examination of the Blood.** During the past year there has been but little work done on this subject, which is proof that the methods now in general use are satisfactory from the clinical standpoint at least. While there is no doubt as to the value of the results obtained by the present methods, the length of time required in carrying out these various procedures tends to lessen their employment to a considerable extent. Attempts have been made from time to time to simplify their examinations, though the modifications suggested so far have not been generally adopted.

MacMunn,<sup>1</sup> with the idea of making the enumeration less hard on the eyes, has made photographs of the Thoma-Zeiss haemocytometer containing blood diluted in the usual manner. In the photographs exhibited the ruling of the cell and the outlines of the red corpuscles could be distinctly seen. The most suitable power for the process was found to be a two-thirds objective and a Zeiss No. 4 eyepiece. The camera and the microscope must, of course, be placed vertically.

The advantages claimed for the method are that the observations can be made rapidly and can be kept as a permanent record. The accuracy of the method can be increased by photographing several drops of the fluid in succession. The negative and positive plates both permit of easy enumeration of the erythrocytes.

While there are some features in their method to recommend it, the

<sup>1</sup> British Medical Journal, January 31, 1903.

cost of the outfit and the additional skill required in making photomicrographs will effectually prevent its general employment.

Still another method is brought forward by Strong and Seligmann.<sup>1</sup>

They have been able to obtain preparations from which the number of red and white cells could be counted at any period after the blood was taken, while the use of any form of counting-chamber was done away with; 5 c. mm. of the blood were diluted a hundredfold with a fixing solution containing methyl violet.

For the white cell count 5 c. mm. of this mixture were blown on to a slide from a pipette graduated to deliver this quantity. The drop was allowed to dry and mounted in Canada balsam in the usual way. When such slides were examined with a one-sixth objective the white cells were seen to be stained a conspicuous blue, lying among the unstained red corpuscles. The former were counted by going over the whole of the dried-up drop with the aid of a mechanical stage. Then, knowing the dilution of the blood, the number of white cells per c. mm. could be readily calculated.

For the red cells count a further dilution of the first hundredfold dilution was made with a solution containing eosin; 5 c. mm. of this were placed on a slide, dried and mounted in Canada balsam. From the total number of red cells present in the film, formed by the dried drop, the total number of red cells per c. mm. was calculated.

This method had been used by the authors for a considerable time in St. Thomas' Hospital, and the results showed practically no deviation from those obtained with the Thoma-Zeiss haemocytometer.

The advantage to be derived from this procedure is rather doubtful, and sources of error are evident. The most apparent source of error would appear to be in getting the drop blown on the slide, to spread out into a sufficiently thin and equal layer, as a perfectly dry and clean slide is not conducive to the spreading out of any watery solution. In some particulars the method resembles that described by Einhorn and La Porte a year ago, which was given in PROGRESSIVE MEDICINE.

Finally an attempt was made to estimate the increase of the leukocytes by the means of chemical reagents. This plan is offered by Mayer,<sup>2</sup> who recommends as a substitute for the enumeration of the leukocytes, where this, for any reason, is impossible, the well-known guaiac test. This gives a positive reaction when there is a leukocytosis of 19,000 or more, and, therefore, does not occur in digestive leukocytosis, but, on the other hand, is found in pneumonia, latent suppuration, abscesses, empyema, etc.

<sup>1</sup> British Medical Journal, May 23, 1903.

<sup>2</sup> Deutsche medizinische Wochenschrift, No. 43, Vereins-Beilage.

In the presence of a large number of leukocytes the addition of oil of turpentine is unnecessary, as, for instance, in a pus solution. In this case the oxidizing action of the turpentine is apparently assumed by a ferment derived from the cells. The author verifies the statement of the earlier writers that the guaiac test is found in the blood of leukæmia (myelogenous, five cases observed), also in the red bone-marrow, but never in lymphatic leukæmia. Only the cells originating in the bone-marrow give the reaction.

**Blood Stains.** In this connection very few new ideas have been brought forth, and they are only modifications of stains or staining methods already well known. A suggestion, which may be of value, is offered by Nutting.<sup>1</sup> He favors the tri-acid stain of Ehrlich on account of its reliability, and believes that its use is lessened because of the difficulty and length of time required in fixing the smears; exposure in a hot-air chamber at a temperature of 150° C. for a considerable period being necessary.

Various chemical fixatives, such as formalin, osmic acid, and alcohol, which have been employed have not yet yielded good results with this stain. The author has found that by fixing the blood smears for three minutes in Merck's methyl alcohol, and then staining for five minutes in tri-acid stain, good results can be secured, though the preparation does not show up as brilliantly as when the films are fixed by heat. By this method, however, the nuclei of the lymphocytes and leukocytes, together with the various granules of the latter, are well shown, as are also the red cells. All that is required is methyl alcohol, tri-acid stain, and tap water.

There are many conditions in which the tri-acid stain gives the best results, and, if this very simple method of fixation will answer in all cases it will be a great aid in saving time and apparatus. Another stain which is suggested by La Porte<sup>2</sup> resembles, as the author says, that advocated by Leischman, which has already been described in a former number of PROGRESSIVE MEDICINE. La Porte's stain consists of two solutions. The first is composed of a 5 per cent. mixture of Jenner's powder (Grübler) in methyl alcohol (Merck's highest purity), which is not filtered.

The second solution is made by mixing one part of Unna's polychrome methylene-blue solution (Grübler's) with 150 parts of distilled water (about two drops of the former to 15 c.c. of the latter). The procedure is as follows:

Take the cover-glass specimen in a Cornet forceps and drop on it five drops of Jenner stain. This is allowed to act for one minute.

<sup>1</sup> British Medical Journal, January 24, 1903.

<sup>2</sup> Medical Record, June 27, 1903.

Then, without removing the Jenner stain, ten drops of the dilute polychrome methylene-blue solution are added and the forceps agitated, so as to produce a thorough mixing of the solutions on the cover-glass. The combined stain is allowed to act for five minutes longer. It is then washed off with distilled water and some of the water permitted to remain on the cover-glass for about one minute longer, with occasional agitation of the forceps. At the end of this time the specimen is rapidly immersed in a very dilute solution of acetic acid (about 1 of 50 per cent. acetic acid to ten ounces of water) until it is of a reddish or pinkish color. It is rinsed again with water and dried in the air. Filter paper or heat should not be employed to dry the specimens.

This stains the red blood corpuscles a distinct pale-rose color. The nuclei of the white as well as of the red cells are of a bright carmine purple; the eosinophile granules are of a bright coppery red; the mastzellen granules of a very deep metachromatic blue. The protoplasm of the large and small lymphocytes is a pale light blue dotted here and there with bright purplish chromatin granules. The network of the blood plates takes the carmine purple cromatin color, the bodies of the blood plates staining a light blue. The body of the malarial parasite is stained blue, its chromatin the same as the nuclei of the white cells, only brighter. Granular degeneration of the red cells appears as fine blue specks in the affected cells. A few minor details must be observed. The specimen should not be fixed in any way and should not be too old. The time given for the Jenner (one minute) and the combined stain (five minutes) should ordinarily be strictly adhered to. There should always be double the number of drops of the dilute polychrome methylene-blue solution to the three or four drops of the Jenner solution. The former should be added drop by drop, and it is always necessary that the distilled water should be left on the cover-glass a minute longer after rinsing off the stain.

A modification of the Romanowski stain has been employed by Preisich and Heim,<sup>1</sup> which is especially adapted for the staining of the blood plaques. In their preliminary publication neither the composition of the stain nor method of employment has been given.

### **RHEUMATOID ARTHRITIS.**

During the past two or three years considerable attention has been directed to the chronic joint conditions either single or multiple, usually designated as rheumatoid or rheumatic. Our lack of knowledge concerning the etiology of joint affections generally and the very great

<sup>1</sup> Deutsche med. Wochenschrift, No. 33, 1903.

variety of conditions under which articular inflammations of varying grades of intensity may occur have led to an almost hopeless confusion, so that recent investigations have been of more than usual importance. It has been pretty generally conceded that acute articular rheumatism is due to bacterial infections, and it is only natural that other joint inflammations, more chronic in character perhaps, but seemingly following in the wake of the acute process, should be attributed to the same source. A study of the subject shows that the matter is by no means so simple. While the chronic joint conditions undoubtedly arise from prolonged or repeated attacks of the true acute articular rheumatism, there are other varieties whose course, when observed for a long period of time, shows them to be essentially different from ordinary acute or chronic rheumatism.

This variety has been given many names, such as rheumatoid arthritis, rheumatic gout, gouty rheumatism, deforming arthritis, arthritis deformans, osteoarthritis, titles which go to show the tendency to ascribe the conditions to gout or rheumatism. Before taking up the question of etiology and pathology it may be well to consider the clinical features of the symptom-complex generally known as rheumatoid arthritis. Perhaps the most satisfactory classification is that adopted by McCrae,<sup>1</sup> who divides the disease into four groups :

1. Heberden's nodes.
2. Polyarticular form (excluding the spondylitis cases which are in one sense polyarticular).
3. Monarticular forms.
4. Spondylitis.

The lines between these groups are by no means sharply drawn, but the majority of cases can be placed under one or the other heading. The popular conception of rheumatoid arthritis is that it is essentially a chronic process, but recently Garrod and later Hale White have called attention to the fact that there is a variety which is marked by the suddenness of its onset and characterized by a recurrence of these acute attacks, each one leaving more or less deformity of the affected joints in its wake. To this variety they have given the name of "acute rheumatoid arthritis," and point to the fact that it occurs in younger individuals than the slowly progressive form. McCrae, more properly perhaps, includes this variety under the head of the polyarticular form, calling attention to the fact that a certain percentage of the cases included in this group give a history of sudden onset and repeated acute attacks.

McCrae's article gives the clinical facts relating to 110 cases observed

<sup>1</sup> Journal of the American Medical Association, January 2, 9, 16, 1904.

in the Johns Hopkins Hospital, and will serve to make clear many of the clinical manifestations of the disease. In order to give a comprehensive view of the condition the general statistics of McCrae's 110 cases may first be given.

*Incidence.* Of the 110 cases 55 were males, 55 females; 106 were white and 4 were colored, and of these 4, 2 were males and 2 females. This small number of negroes is of interest, especially in reference to the association of previous septic conditions as a possible etiological factor, since the colored people are susceptible to the majority of infections, especially gonorrhœa. From McCrae's statistics the negro seems to be more susceptible to acute rheumatism than to arthritis deformans.

*Conjugal Condition.* Fifty-three were married, 41 single, and 16 were widowed.

*Nationality.* Ninety-six were born in America, 8 in Germany, 2 in Ireland, and 1 each in England, Bohemia, Russia, and Poland.

*Occupation.* The largest number were engaged in housework of various kinds, 47 cases; 7 others had similar work, such as sewing, washing, etc. The next largest group, 24 cases, included merchants, clerks, teachers, etc.; 11 were farmers, and 10 were mechanics or laborers. The remainder had no special occupation. The proportion engaged in occupations involving special exposure to wet, damp, etc., is strikingly small.

Age.		Age.	
1 to 10 . . . . .	2	51 to 60 . . . . .	10
11 " 20 . . . . .	8	61 " 70 . . . . .	7
21 " 30 . . . . .	19	71 " 80 . . . . .	2
31 " 40 . . . . .	35	81 " 90 . . . . .	1
41 " 50 . . . . .	17		

The youngest was aged four years (a case of "Still's disease") and the oldest eighty-three years, with Heberden's nodes and some joint changes.

*Complaint.* Thirty-six complained of "rheumatism," 23 of general joint symptoms, pain, stiffness, and swelling, 20 complained especially of pain, 10 of stiffness of the back, 6 of loss of power in the legs and difficulty in walking, 3 of sciatica, 2 of neuritis.

*Family History.* There was a definite family history of arthritis in 44 cases. Of these, 10 were undoubtedly arthritis deformans, 22 were given as rheumatism, 1 as gout, and in 11 the nature was unknown. There was a family history of tuberculosis in 28 cases, and this was associated with arthritis in 9.

*Previous History.* Measles had occurred in 68, pertussis in 31, mumps in 20, scarlet fever and malaria each in 18, chicken-pox and influenza each in 13, typhoid fever in 10, pneumonia in 7. Recurring attacks of tonsillitis had occurred in only 3. A previous history of

gonorrhœa was obtained in only 14, syphilis in 4, and chancroid in 1. In 3 cases dyspeptic symptoms were prominent; 4 gave a history of nervous prostration, and 2 insisted on great worry and mental strain over a period of years; 1 gave a history of great physical hardship, and 2 only of working in especially damp surroundings.

*Alcoholic History.* Six were heavy drinkers, and 21 used alcohol moderately. This is in striking contrast to the figures reported from the cases of gout observed in the same clinic.

*Pregnancy and Miscarriage.* Twenty-six of the female patients had borne children, and 7 had had miscarriages, varying in number from 1 to 4; 5 patients had both borne children and had miscarriages.

*Onset.* This was apparently associated with some condition in 28 cases. In 7 cases it was associated with exposure to cold and wet; in 3 each it was apparently associated with injury, diarrhoea or dysentery, confinement, an attack of influenza, and an attack of measles; 2 followed closely after typhoid fever, and in 1 each it was associated with the following conditions: very marked mental strain, constant physical strain, miscarriage, and menopause. The very small percentage associated with exposure is to be noted.

**Heberden's Nodes.** Taking up the individual groups, Heberden's nodes are first considered. These nodosities were met with nine times in 94 polyarticular cases, and were not seen in any of the spondylitis cases. Of interest is the occurrence of these lesions which are "osteoarthritic" in association with the "rheumatoid" changes in the other joints, as it shows that the two conditions may occur at the same time. But little is known concerning the nature of Heberden's nodes. It can be summed up by saying that these bony outgrowths at the terminal phalangeal joints of the fingers rarely cause any troublesome symptoms, and usually occur without the larger joints being involved, but may be associated with the other manifestations of the disease, although these cases are comparatively rare. They resemble the lesions in the other joints in that they are susceptible to injury.

**Polyarticular Cases.** There were 92 of these cases in the series, to which may be added 2 of the cases of "Still's disease." The ages at which onset began were:

1 to 10 . . . . .	11	41 to 50 . . . . .	10
11 " 20 . . . . .	17	51 " 60 . . . . .	11
21 " 30 . . . . .	18	61 " 70 . . . . .	2
31 " 40 . . . . .	22	71 " 80 . . . . .	1

**METHOD OF ONSET.** Two fairly definite modes can be recognized, namely, a sudden and gradual beginning. Of the 92 cases the mode of onset was doubtful in 6, gradual in 45, in 31 of these several joints being involved together at the beginning, and in 14 one joint, others

following sometimes later ; in 41 cases the onset was sudden, in 19 of these in one joint, and in 21 in many joints at the same time. In 1 case the onset was in the joints of the neck. The number of cases having a sudden onset is worthy of note, as the ordinary teaching is that the gradual mode is by far the more common.

**THE JOINT FIRST INVOLVED.** In 3 there was no definite history ; 28, many joints involved ; 3, the neck joint first involved ; 5, the shoulders, 3 being only in one shoulder ; 4, one arm ; 1, an elbow ; 3, a wrist ; 1, a thumb ; 1, a single finger ; 1, both hands ; 9, one hip ; 10, one knee ; 3, both knees ; 1, knees and elbows both ; 1, both ankles ; 1, one ankle ; 10, the feet ; 3, the great toe ; 2, other toes ; 2, the joints of one leg.

**CHARACTER OF THE ATTACK.** Only an approximation to a classification is here possible. Considering the course of the disease three groups can be recognized. The first is the slow progressive type, in which, after either an acute or a gradual onset, the symptoms slowly advance, joint after joint being involved. This may go on for a great many years. There were 44 such cases. In sharp contrast are those of the second group, in which the attacks are acute, and very commonly come on at intervals and at intervening times, perhaps for many years the patients may be practically free from any symptoms, although at length permanent damage is done. In some of these cases the patients may recover almost perfectly between the attacks. To this class belong 29 cases. The third class shows features common to the two preceding, in that there were acute attacks, but with these a steady progress of the disease. There were 12 such cases ; 7 cases were impossible to classify. In nearly one-half of the cases there was a history of acute attacks of pain and swelling in the joints, and the author thinks that it is to this fact that we owe the belief that acute rheumatism is common before the development of arthritis deformans. There seems little doubt that these acute manifestations were due to the rheumatoid arthritis. Of the 32 cases giving a history of previous acute attacks, after which they were practically free from symptoms, 14 had one such previous attack, 2 had two attacks, 4, three, 4, four, 2, five, and 1, ten attacks. There were 33 cases in which an intercurrent condition was thought to have determined the onset of another attack of further symptoms. These intercurrent conditions included injuries, wetting or exposure, diarrhoea, influenza, confinement, miscarriage, marked shock, gonorrhœa, measles, excessive fatigue, hot bathing, menstruation, and chancroid.

This description of the acute attacks occurring in the polyarticular form suggests the "*acute*" *rheumatoid arthritis* of Hale White, but fails to bring out the symptoms on which this observer lays stress. As

observed by White the disease begins suddenly with pain and swelling of symmetrical joints, fever from 100° F. to 101° F., and a pulse rate which is rapid in proportion to the temperature, and not dependent on heart disease. The process extends rapidly and may involve all the joints of the upper and lower extremities, and may extend to the joints of the spine and the jaw. The muscles waste rapidly, there is a marked pallor, with sweating of the hands and feet. After three or four weeks the pallor disappears somewhat, the sweating of the hands and feet diminishes, the temperature slowly regains the normal, and the pulse becomes slower. The pain diminishes, but the swelling and immobility remain. Fresh attacks may occur. After the acute stage has subsided the patient may be a chronic invalid as a result of persistent swelling of the synovial membrane and the surrounding soft tissues, leading to loss of motion and marked atrophy of the large muscles. Careful manual examinations fail to reveal any bony outgrowth in connection with the joint, the deformity appearing to be entirely due to the effusion into the joint and swelling of the surrounding tissues. This is borne out by radiographic findings. In the cases reported by White more or less acute manifestations lasted over a period of twelve to eighteen months, to be followed by intervals of quiescence lasting one or more years. Some joint impairment followed each attack.

*JOINTS.* *Cervical Vertebrae.* These were found to be involved in 29 out of 92 cases. Usually the involvement was transitory and consisted in pain on motion and restriction of movement. In only a few instances did the author find permanent stiffness. The physical examination showed but little.

*Temporomaxillary Joint.* This was affected in 22 cases. The involvement is often unilateral and transitory, but may produce permanent disability. The involvement of this joint should be considered as of great importance in diagnosing doubtful cases of polyarthritis.

*Sternoclavicular Joint.* This was affected only 6 times. There was usually pain on motion and at times some swelling. It rarely caused much discomfort.

*Shoulder-joints.* Both shoulders were involved thirty-nine times, the right alone eight times, the left alone three times. In the acute attack there was usually pain on motion, especially on raising the hand to the head. Effusion into the joint was infrequent. When chronic there is limitation of movement, crepitus, pain, and, later on, atrophy of the muscles.

*Elbow-joints.* Both joints were involved in 31 cases, the right only in 4, the left only in 8. In the acute attack the elbow is flexed, there is often swelling, and not infrequently some involvement of the muscles above and below the joint. In 1 case the joint was opened during the

attack under the idea that it was gonorrhœal arthritis. There was a slight œdema of the muscles and some fibrin between the muscle fibres. There were some areas of hemorrhage, and the joint contained some viscid yellow fluid. The synovial membrane was gelatinous in appearance and showed some hemorrhage.

*Wrist-joints.* Both wrists were affected in 36 cases, the right only in 5, the left only in 5. Effusion was noted only in one instance, but there was often marked swelling above and below the joint, especially below. Crepitus is often obtained.

*The Hands.* The metacarpophalangeal joints were involved in 43 cases. In the acute stage there is a certain amount of redness, swelling, and tenderness, and as this subsides a variable amount of thickening is left behind. In the later stages the thickening is permanent, the motion lessened, and there is usually flexion and often subluxation.

*Fingers.* These were involved in 52 cases. The thumbs were alone affected in 7. In the acute attack there is little visible change. Later on thickening is more marked and the fusiform joint is formed. In the later stages there are seen a great variety of deformities, a common one being flexion of the first phalanx with extension of the terminal ones. Other features of note are sudden weakness in the wrist-joint, causing the patient to drop things. This may occur in the earlier stages. Another point is the occurrence of pain about the ball of the thumb or on the ulnar surface of the wrist, even when no activity is present. Atrophic changes are also noted about the hands. The nails may be ribbed and the skin glossy.

*The Hip-joints.* These were both involved in 25 cases, the right only in 3, the left only in 3.

*Knee-joints.* Both knees were affected in 65 cases, the right knee only in 7, the left only in 8. Effusion was met with in 14. In the later stage the joint is usually fixed, there is often crepitus and marked thickening in the periarticular structures. This can be made out by running the finger up and down on the inner surface of the joint in the interval between the bones.

*Ankle-joints.* Both ankles were involved in 37 cases, the right only in 5, the left only in 6. The ankles show much the same changes as are noted in the wrists.

*Feet and Toes.* There was involvement in some of the foot-joints in 11 cases, of the toes in 10, of the great toe only in 6.

It has been customary to lay stress on the symmetry with which the joints are involved in this disease, but it will be noted in this series that a considerable number of cases showed involvement of only one joint. As a rule, the large joints of the legs suffer more frequently than those of the arm.

*Effusion.* The fluid obtained by aspiration is usually turbid and contains a certain amount of granular material with polymorphonuclear leukocytes. No hemorrhagic exudate was met with.

*Muscular Atrophy.* This is present in the majority of cases, but in certain acute forms only after successive attacks. This is not invariable, as in some cases the atrophy appears very early. The atrophy is especially well shown in the interossei giving a characteristic shape to the hand.

*Temperature.* Fifteen cases had a normal temperature, while 59 had a temperature varying between 99° and 101° F. This is of importance in the diagnosis. One patient had a severe chill.

*Circulatory System.* There are notes on 74 cases. The heart was normal in 55; a systolic murmur (non-organic) in 10; marked irregularity in 2; organic disease in 7. In some arteriosclerosis was present. In over two-thirds of the cases the pulse was above 90. This is also an important aid to diagnosis, as the increased pulse rate was in cases more or less slowly advancing.

*Urine.* Of 83 cases 64 showed clear urine; a trace of albumin in 9; albumin and casts in 10; sugar only once. Estimations of the total uric acid output showed normal amount.

*Glands.* Of 33 cases the glands were generally enlarged in 13; definite enlargement of some glands in 4; no general enlargement in 16.

*Spleen.* In 39 cases the spleen was found enlarged in 4 only.

*Subcutaneous Fibroid Nodules.* These were found in 7 cases, a larger percentage than was noted in their cases of acute rheumatism. They were all found in patients over twenty-seven years of age, while in rheumatism the nodules are almost always found in children.

*Pigmentation.* Marked pigmentation was noted in 8 cases, though it is doubtful if this represents all pigmented cases. McCrae thinks that pigmentation is no more frequent in arthritis deformans than in other conditions, contrary to Spender, who laid stress on the occurrence of pigmented areas on the forehead, face, and forearms as being diagnostic.

*Blood.* In 33 cases the haemoglobin averaged about 70.6 per cent.; the red blood cells in 29 cases, 4,468,000. Average leukocyte count in 33 cases was 7600, and of these only 9 were over 10,000. In 2 of these the leukocytosis was probably due to other conditions, acute pleurisy in one, general pneumonia infection in the other. Differential counts gave practically a normal finding.

*Reflexes.* The findings were inconstant. They were found to be exaggerated, normal or decreased, but rarely absent. Ankle clonus was obtained in a few instances, but he never obtained extensor response to plantar stimulation.

*Unusual Features.* Pleurisy, severe diarrhoea, chill, jaundice, abdominal pain, mental features, purpura, enlarged thyroid, bronchitis, and paralysis were noted among the unusual features.

**ETIOLOGY.** The polyarticular form of rheumatoid arthritis constitutes both the largest and the most important group, and as most of the investigations relative to etiology and pathology have been made on cases of this type the subject may well be considered here. At present two theories exist—the theory of a nervous origin first suggested by John K. Mitchell in 1833, and the infectious theory of more recent date. While it is probable that many of the cases seen by Mitchell were instances of neuroarthropathy, the very constant association of nervous disturbances in the disease point strongly, as Osler has said, to a neurotrophic basis. Among the facts pointing to this association are the frequent preceding history of shock, worry, grief, and exposure, also the operation of influences, the result of which must be a deterioration of nerve force and loss of vitality; the similarity of the lesions to the arthropathies of cord disease; the symmetrical distribution; the trophic changes leading to alteration in the skin and nails, and often muscular wasting out of proportion to the joint changes; peculiar alterations in the reflexes; and the clinical course of the disease, which is entirely compatible with the theory of primary changes in the nervous system. Ord looks upon the disease as analogous to progressive muscular atrophy due either to a primary lesion in the cord or to changes, the result of peripheral irritation. Jones<sup>1</sup> considers that the condition arises from a cerebrospinal toxæmia, and points out numerous vasomotor phenomena that are associated with the disease.

The defenders of the theory of the infectious origin of rheumatoid arthritis are many. McCrae inclines to this belief, and mentions as facts in favor of it the often sudden onset, with involvement of many joints, the fever, increased pulse rate, and the recurrence of these attacks. The results of his cultural experiments were negative. McCrae thinks there are many suggestive facts that point to the possibility of many organisms (influenza, gonorrhœa, etc.) as being capable of inducing the condition, as there is no doubt as to the association of attacks or exacerbations with various infections, as influenza. Against this latter conception may be urged the fact that one meets with patients suffering from well-marked rheumatoid arthritis who experience complete relief from all joint symptoms during an intercurrent attack of another acute disease. A patient of mine in the University Hospital was free from all joint symptoms so long as an attack of influenza remained. She volunteered the statement that whenever

<sup>1</sup> Edinburgh Medical Journal, January, 1903.

she had some acute illness she had no pain, but as soon as she began to get well the pains came back.

Malin<sup>1</sup> mentions a patient whose joint pains were relieved during attacks of asthma, and Weishart<sup>2</sup> states that in four patients with rheumatoid arthritis the joint pains disappeared with the occurrence of obstructive jaundice. The most ardent supporters of this theory are Poynton and Payne.<sup>3</sup> Their cases and bacteriological findings may be given in detail.

A man aged sixty-seven years dying from carbolic-acid poisoning was found at autopsy to have certain crippled joints from a chronic destructive arthritis. This was especially the case of the tarsal joints of the left foot and left knee-joint and the terminal joint of the right index finger.

The left knee-joint contained about 2 drachms of a clear yellowish fluid, in which floated a few flakes of exudation. The synovial membrane was thickened and in places hyperæmic. The cartilages from the outer facet of the patella and in great part over the articular surface of the tibia and femur were completely destroyed.

The remaining cartilages had lost their gloss. The bones were eburnated at the points of pressure. The capsule of the joint was moderately thickened. Floating in the synovial fluid was a loose body, probably resulting from organized inflammatory exudate. The heart valves were normal.

No post-mortem evidence of rheumatism was obtained. A film made from the knee-joint exudate showed a few diplococci. Cultures from the synovial membrane showed the presence of a diplococci and of the bacillus coli communis. Sections of the membrane demonstrated the presence of diplococci situated especially in the finger.

Poynton and Payne injected a rabbit intravenously with cultures of this diplococci on blood agar. Two days later the animal showed arthritis of the left carpus, and later arthritis of the left shoulder and then of the upper knee-joint. Later on the animal was killed, and a whitish fluid containing flakes of exudation was found in each of the affected joints. Films from this showed diplococci. The cartilages showed no erosion, and no lesions were found in the heart or other viscera. Another rabbit was injected on July 30th intravenously; throughout September nothing was noticed but slight wasting of the right hind leg; in October a slight excess of fluid was noticeable in the right knee-joint. There was definite atrophy of the muscles of the thigh and leg. The animal was killed, and definite changes were found in the bone and cartilages. The cultures from the joint were sterile.

<sup>1</sup> British Medical Journal, February 4, 1903.

<sup>2</sup> Ibid., January 31, 1903.

<sup>3</sup> Transactions of the London Pathological Society, 1902, vol. liii.

They concluded from their experiments that this diplococcus was the cause of the arthritis in the case from which it was isolated and of the conditions produced in the experiments on rabbits.

These results while interesting are by no means conclusive, and fail to meet with Koch's law. Cultures made from Hale White's<sup>1</sup> case resulted in the isolation of a small non-motile bacillus from a mesenteric gland, which was non-pathogenic to rabbits and mice. From the left knee a diplococcus was isolated which was likewise non-pathogenic to rabbits and mice. Gask<sup>2</sup> isolated a streptococcus from a case of acute rheumatoid arthritis following delivery, which resembled the streptococcus pyogenes, but which was non-pathogenic to mice and rabbits. Finally, to complicate matters still more, come the efforts of Poncet and his pupils, and Edsall and Lavenson<sup>3</sup> to show a causal relation between rheumatoid arthritis and tuberculosis. Many points speak in favor of this relationship, such as the frequent occurrence of pulmonary tuberculosis in patients suffering from chronic polyarthritis, the common family history of tuberculosis (28 out of 110 cases of McCrae), and the fact that the same general conditions of environment favor the development of both conditions. Edsall and Lavenson tried the tuberculin test on 18 patients, and in several obtained results that were indicative of a tubercular infection as the cause of the joint condition.

When one considers the varying number of organisms isolated and the paucity of results from animal experiment it is evident that the conclusion that rheumatoid arthritis is due to distinct organismal infection is scarcely justifiable in the light of present knowledge. It should be borne in mind, as I have stated in discussing this question,<sup>4</sup> that micro-organisms of different kinds frequently gain entrance to the tissues and invade practically all parts of the body in the terminal stages of chronic disease. In many instances in which the discovery of bacteria in the tissues has been reported this terminal infection would explain the presence of the organisms rather than the specific nature of the disease under investigation.

**PATHOLOGY.** As McCrae says, until we are certain of the etiology we can determine the morbid anatomy only, and the majority of the descriptions are of the late changes. Hale White<sup>5</sup> has reported the findings in a comparatively acute case.

In a proximal interphalangeal joint with marked changes he found that the most marked alteration was in the synovial membrane. This showed the formation of new fibrous tissue and evidence of both recent and chronic inflammation. The membrane on the cartilage opposite

<sup>1</sup> Loc. cit.

<sup>2</sup> Quoted by Poynton, *The Practitioner*, July, 1903. ;

<sup>3</sup> American Journal of the Medical Sciences, December, 1903.

<sup>4</sup> Stengel, *ibid.*, March, 1903.

<sup>5</sup> Loc. cit.

the thickened fringe showed thickening and the formation of fibrous tissue. The cartilage beneath this was thinned and eroded, and in places the erosion had gone through the cartilages. In connection with these areas there were foci of inflammation in the bone, but these changes were slight in comparison with those found in the synovial membrane. The synovial fringes in the knee-joint showed no bony deformity, only the usual "thinned" condition of the ends of the bones so characteristic of these cases.

White concludes that "the pathological changes in acute rheumatoid arthritis consist in a chronic inflammation of the synovial membrane, together with a thickening of the tissues outside the joint. The pitting of the cartilage is slight and secondary to the changes in the synovial membrane. The cartilage seemed healthy, and the affection of the bone is slight and due to perforation of the synovial membrane. There are no bony or cartilaginous outgrowths." The pathological findings in the very long-standing cases are familiar and need not be discussed.

**DIAGNOSIS.** In the advanced stages this is usually easy, as the picture presented is typical. In earlier periods, and particularly in the variety called "acute," the diagnosis is more difficult. As our treatment in advanced cases is hopeless, there is the possibility that, perhaps, by early recognition some checking of the progress may be attained; and on this ground the early diagnosis is important, and only the early cases need be considered.

The important diseases to be differentiated from rheumatoid arthritis are :

1. *Acute Articular Rheumatism.* The chief points to be noted are that the polyarthritis of arthritis deformans rarely shift from joint to joint. There is rarely the sudden disappearance of the arthritis in the given joint, so characteristic of rheumatism. The joint rarely shows the severe local tenderness of rheumatism, and, while redness may be present, it is not extreme. There may be effusion, especially in the knee-joint, but usually the surrounding structures are more swollen than the joint itself. Several joints are often involved which are rarely concerned in rheumatism, especially the joints of the neck and jaw. The involvement of the fingers is characteristic. The temperature is usually not very high, and the pulse is nearly always above normal. The enlargement of the lymph glands, especially those associated with the affected joints, speaks for arthritis deformans, as does the absence of cardiac involvement and the failure of the salicylates. Another suggestive fact is the rapid muscular atrophy as well as the increase of the reflexes. The case is apt to drag on, the temperature remaining perhaps at 99° F. or over, the pulse rate increased, and the joint

symptoms persisting. This is always suspicious. If after acute symptoms have subsided joint deformity and alteration persists one should always reconsider the diagnosis of acute rheumatism.

2. *Acute Gout.* This is not likely to be a frequent cause of difficulty, but it is a possibility. The common alcoholic history in such patients, the attacks usually clearing up rapidly and leaving little damage in the joints, and the results of uric acid estimations, should all prevent error.

3. *Gonorrhœal Arthritis.* This is likely to cause difficulty only when several joints are involved at the same time. One should always cultivate the habit of keeping these conditions in mind and searching carefully for the gonococci. In the doubtful cases of polyarthritis the diagnosis of the acute articular rheumatism should be made last. Other conditions of the joint will not be apt to come into consideration in the diagnosis.

**TREATMENT.** First. The acute change. The patient should be put at rest and clothed in flannels. If there be much fever the diet should be liquid. If pain is annoying, antipyrin in 5-grain doses, guaiacol or codeine in small doses, should be given ; morphine is rarely necessary. Of local measures to the joints, ice-bags, cold compresses, oil of wintergreen, lead-water and laudanum, baking and general massage may give relief. All measures, however, may fail to ameliorate the condition. After the acute symptoms have subsided the great principle of the treatment consists in keeping up the general nutrition. Fresh air, a full meat diet, with nourishment between meals, are indicated. The teeth and gums should be put in good condition. Caution is necessary in the use of baths. Locally massage of the joint, with baking, is of value, but the baking should not last longer than twenty to thirty minutes. In the absence of acute symptoms the more the joints are used the better for the patient. Only two drugs are of value : syrup of the iodide of iron and arsenic. They may be given alternately or combined, but in any case should be kept up for long intervals, even at different periods of years.

*Surgical Treatment.* Surgical treatment may be of benefit in certain cases. In those with contractures the tendons may be divided and the limbs straightened, or under an anæsthetic the limb may be forcibly straightened and put in plaster for a few days. With excision of joints we have had little experience. This probably will be useful in the knee and elbow-joint.

**PROGNOSIS.** This is usually rather gloomy. The general tendency of the disease is to progress, but we have to remember that in many cases the disease was never diagnosed until more or less permanent changes had occurred. McCrae obtained reports from 25 patients

who had been in the hospital over three years ago ; 2 could be ascribed as well, three had died from an unknown cause, and only about one-half of the remainder were much worse. The prognosis must always be a guarded one.

**The Monarticular Form** comprises a group of cases about which there is also much difference of opinion. The frequency is doubtful. Probably many of the cases diagnosed as chronic rheumatism belong here, and also the group termed " *morbus coxae senilis*. " The disease generally occurs in elderly people, one of the larger joints, most often shoulder or hip, is involved, and the general type of change is degenerative. There were only 3 cases of this type in McCrae's series ; 2 of the patients were females, and all were white. The ages were thirty-nine, forty, and fifty years. In 2 the shoulder-joints were involved and in 1 the hip. In both shoulder cases the onset had been rather sudden. They complained principally of pain and difficulty in moving the joint ; later the pain became less and the limitation of motion remained. The third case was more gradual. There was pain in the hip and down the leg, with gradually increasing stiffness.

The symptoms were much the same in all—pain on motion, distinct limitation of motion, crepitus, and some muscular wasting. In one of the shoulder cases the reflexes on the affected side were much exaggerated, and normal on the other side. She also showed signs of slight involvement of two finger-joints on the other hand. There were also some areas of pigmentation. The temperature in two averaged 99° F., in the third it went up to 100.5° F. The pulse rate in all was about 90.

The diagnosis in these cases may offer some difficulty. A gonorrhœal arthritis can usually be excluded, and the greatest trouble generally is to distinguish it from a *tuberculous joint*. If the characters of the joint involvement do not give the diagnosis tuberculin may be used. It has been found very satisfactory. The finding of slight suggestive changes in other joints is conclusive. Treatment is usually only palliative. Local measures, massage, wet packs, etc., are often used, and in some instances surgical measures may give a more efficient joint, especially at the hip. But too often the degenerative changes advance gradually, as in polyarticular form. Every endeavor should be made to keep up the general health.

**Spondylitis.** There are two types of cases, one with general and the other with local involvement. The former is the more readily diagnosed. In this class of cases bony changes predominate. Rheumatoïd changes may also occur in the same patient. There were 22 cases showing spinal change : in 13 there was spondylitis alone, while in 9 this was accompanied by symptoms in other joints. The spine was

generally involved in 6, locally involved in 7, while in 9 the spine and other joints were affected. Whenever the spinal involvement was associated with other joint changes the spinal lesion was never local ; 20 of the cases occurred in males, 2 in females, all of whom were white. Only 1 case was under twenty years. The great majority were between twenty and forty years.

**COMPLAINT.** This in the majority of instances was pain and stiffness in the back and legs ; besides, there was often crippling and general weakness. The onset of the disease began before the age of thirty in 16 cases : in 13 cases the onset was gradual in 11 ; sudden in 1, and doubtful in 1. In 2 of these there is a history of previous acute attacks of polyarthritis which apparently left no damage. In the other cases there is a history of previous attacks of local spondylitis from which they recovered completely.

**GENERAL FEATURES OF THE SPONDYLITIS CASES.** These are most characteristic in cases of general involvement. In some the head is held forward, and there is marked bowing of the upper spine, and rotation in the cervical region is lost. The head cannot be rotated ; there is much difficulty in stooping and in picking objects from the floor, as the spine remains straight and the position is a crouching one. Natural curves of the spine are often lost and the bowing of the upper dorsal and cervical regions is at times marked. In the type of local involvement this condition may affect the position of the spine. The area is usually the lower dorsal and lumbar regions. The patient may complain of the back, of pain or stiffness, or, very often, of pain in the legs. This latter is common, especially over the course of the sciatic nerve, and there is little doubt that many cases regarded as sciatica are really arthritis deformans of the lower spine. Ordinary examination shows little. It is only when an attempt is made to have the patient do several movements that the rigidity of the spine becomes evident. If the hips are held firmly and the patient is directed to bend forward, backward, and to the side, restriction of movement becomes evident. There may be some alterations in the natural curves of the spine ; lateral curvature may be present ; there may be marked prominence at the junction of the cervical and dorsal regions, or the lumbar curve may have disappeared. Occasionally the back muscles may be very rigid or they may show a wasting.

**Emaciation.** This is often marked and may be accompanied by pallor. The muscles of the back, but especially those of the buttocks and legs, may show local wasting. This is not always symmetrical.

**Reflexes.** Both the knee-jerks and the Achilles reflexes are usually increased in the legs. With this increase in the legs the arm reflexes in the local spinal cases are usually normal. In only one case was

there a diminished knee-jerk. The cremasteric reflex was increased in 2 cases, and ankle clonus was obtained once. In 1 case it was found that the reflexes were all increased on the side, showing more signs, and normal on the other.

*Temperature.* Of 13 spinal cases 4 were normal, 5 averaged 99° F., in 2 it varied between 99° F. and 100° F.

*Pulse.* In the spinal cases 5 were normal, 4 were between 80 and 90, and 3 were between 90 and 100.

*Blood.* In the spinal cases there were four counts with an average haemoglobin percentage of 76 ; red cells, 5,205,000 ; leukocytes, 7800. The leukocytes were over 10,000 in only one. In 4 mixed cases the haemoglobin averaged 69 per cent. ; red cells, 4,980,000 ; leukocytes, 6300. The differential counts were normal in both forms.

*Tuberculin.* This was tried in the spinal cases, and always with a negative result. It is a great help in the matter of diagnosis.

*Radiography.* This shows the characteristic changes.

**PATHOLOGY.** In these osteoarthritic cases we have usually a marked overgrowth of bone. There is proliferation of the articular cartilages, and later ossification of these growths. Certain other structures may also be involved in the bony change, such as the ligaments or fibrous tissue. The histological structure of this new bone presents no peculiarity. In the spine the process frequently begins on the anterior aspects of the bodies of the vertebræ and extends along the ligaments. With these there is a deposit of new bone. The subsequent course is very variable. If the process is very active the intervertebral cartilages may be replaced by the bone before any absorption occurs. In such cases we have a typical "poker spine." Should there be gradual atrophy of the cartilages without replacement by bone gradual curvature will result. This is seen very markedly at times in old men, who make little complaint of any symptoms. These various processes may occur throughout the whole spine or be limited to certain regions. These changes may occur in the posterior portion of the vertebræ, and the lateral or spinous processes be involved. The articulations may be involved both between the vertebræ themselves and with the ribs. This latter gives an interesting condition, namely, almost complete absence of any movement of the ribs and the practical loss of any costal breathing. There may be severe pain complained of in the acute stages when the patient tries to take a long breath. Should the growth of the bone encroach on the foramina, it is readily seen why pain referred to the distribution of the nerves passing through them is so common. This may be unilateral. The stiffness, of course, is due to the local condition. Pain may be in the back itself, but is very frequently referred to the areas of distribution of the nerves involved.

**DIAGNOSIS.** The cases of general involvement are so characteristic as to cause no trouble. The local involvement may be confused with sciatica, lumbago, and neurasthenia. The symptoms chiefly complained of are stiffness, interference with motion, pain, and general weakness. It may be that many of the pains complained of in the back, especially in the morning on waking, are due to this condition. Many of the cases of lumbago, as well as cases of the so-called sciatica, are caused by arthritis of the spine, as are also obscure pains in the legs and about the body. Of the methods of diagnosis, first comes examination of the spine; the patient should be stripped down to the hips at least. Inspection may show little or nothing. There may be some curvature or a projecting spine, wasting of muscles in the dorsal or gluteal regions or in one or both of the legs. They may stand with one leg a little flexed and "favor" that side. Next comes the investigation of the mobility of the spine. With the legs straight the patient is asked to bend forward and touch the floor, bend back and to each side. The limitation of motion is readily recognized. The attitude in attempting to pick up objects should be noted. Sensation should be tested. The reflexes are usually increased. Two important aids of diagnosis are tuberculin and the *x-ray*. The use of tuberculin excludes the most common source of difficulty, while the radiograph, if it shows anything, is usually characteristic. The deposits of bone usually appear as shadows between the bodies of the vertebrae. In early cases little may be seen, and in very fat patients it may be difficult to get a very clear plate. Should the diagnosis not be certain a light plaster jacket should be applied, extending from the axillæ to the line of the trochanter. If there be spondylitis there should be marked improvement in the symptoms in a few days. This is especially useful in the cases with sciatica.

**TREATMENT.** Improvement of the general nutrition by good feeding, fresh air, sunlight, and tonics. Massage, bathing, and baking to a limited extent may be used. Locally the main object to be obtained is rest. This requires some sort of a jacket. The best plan is to put on a plaster jacket, from two to four weeks, and then a strong leather one. With the parts at rest, the pain lessens and the muscular irritability diminishes. In a case with much curvature the muscular contraction is quite often largely responsible, and the method of wearing a jacket will often completely correct this. The jacket should be put on with the patient as straight as possible, but no force should be used. If there be a deformity the jacket will often gradually correct this, and a second one can be put on in two weeks. Support is required until the process is at a standstill. After the condition is improved much care should be taken to keep up the general health, in order to lessen the chance of subsequent attacks. In the cases with general involvement

the damage is done and some form of light jacket may give relief, but the general health is the most important thing. The early diagnosis is the most important consideration in treatment. The prognosis should be guarded, as the disease may progress in spite of all treatment.

**Conclusions.** The points to which special attention is directed are :

1. The frequency of the occurrence of acute polyarthritis in arthritis deformans and the danger of mistaking this for acute rheumatism.
2. The importance of the recognition of the spinal forms of the disease, especially the local involvement.
3. That in arthritis deformans we have an obscure disease of considerable frequency worthy of study, especially from the etiological aspect.

## GOUT.

**Theories.** By far the most pretentious series of articles on this question produced during the past year are contained in the symposium on gout appearing in the *Practitioner* of July and August, 1903. This series shows very plainly that our knowledge of the disease is a most incomplete and unsatisfactory one, and of the various writers represented in the above series no two seem to have the same idea as to the pathogenesis of gout. But this very fact emphasizes the importance of continued study, and there is no doubt that the discoveries of importance will be made by those investigators who are devoting time to the consideration of the metabolism in this condition, though it must be admitted that as yet results generally accepted have not been attained.

According to Haig, "gout is not a constitutional disease due to any defect in the formation or functioning of the body. It is a form of 'diet' disease due to food poisoning." Unfortunately this very easily understood conception is scarcely borne out by facts, and has comparatively few supporters. This view attributes marked poisonous properties to uric acid, and considers gout to be a simple poisoning by this substance. The majority of observers, however, differ from Haig in this respect. While it is generally conceded that there is an increase of uric acid in gout, the belief is becoming general that this increase is only a symptom of an underlying disease process, just as leukocythaemia is a symptom of leukæmia.

According to Luff, "gout is a disease due to faulty metabolism, probably both intestinal and hepatic, as the result of which certain poisons (possibly the purins and other bodies, but of which we at present know but very little) are produced and lead to an autointoxication which is an early factor in the development of the gouty condition. This autointoxication coincides with or is followed by, in the majority of cases, a deposition of sodium biurate in certain of the joints or tissues,

which constitutes the climax of the gouty attack." This author believes that uric acid and its salts are of subsidiary importance, and that the deposition in the joints is probably only a symptom, the joint manifestations being probably dependent upon much more general conditions than mere excess of uric acid in the blood.

Duckworth believes that there is a nervous basis to gout, and a similar theory is advocated by Scherk.<sup>1</sup> The latter author thinks there is a disturbance of the central nervous system which, acting on the pancreas, brings about some change in this organ, so that its ferment (trypsin) comes to act especially on the nuclein with the production, among other substances, of uric acid. Insufficient innervation is thought to produce an insufficient trypsin, which, however, produces uric acid, but of another chemical composition than the normal, so that it is no longer capable of excretion by the kidneys, but remains in the blood to be eventually deposited in the tissues.

These are some of the varying ideas as to the disease, and with the departure from the old conception that gout consisted in a deposit of urates in the joints or other tissues, a very great variety of conditions has come to be looked upon as gouty. Thus Bannatyne says : " It is thus seen that in dealing with gout we have a disease which may give rise to almost any symptom and affect almost any organ or function." This tendency to attribute to a " gouty condition " all sorts of symptoms is bewildering, and the statement of Allbutt in his introductory essay to the symposium above mentioned is worthy of note. " Now, if gout is uratic arthritis, at any rate we know where we are; when we quit this rock and trusting to sundry pilots, try to plant the flag on a motley archipelago of dwindling kidneys, torpid livers, flatulent dyspepsias, megrims and melancholies, we are sailing on uncharted seas. A patient in gout ought to be more or less gouty; and if we perceive other disorders consistently hovering about this gout, premonitory, contemporary, or consequential, as the case may be, we may know them by their associates and include them cautiously in the same predicament; but to say of many and many a patient that he is gouty when he has never had a uratic arthritis in his life, seems a topsy-turvy nosology."

**Metabolism in Gout.** In one point at least there is a unanimity of opinion, that in gout the underlying cause brings about some changes in the chemistry of digestion as a result of which the end products are no longer capable of being handled in the usual manner. Walker Hall, in the *Practitioner*, takes up this side of the question. After showing the manner in which the normal individual disposes of the food ingested, he contrasts with it the condition present in simple starvation. Here

<sup>1</sup> Zentralblatt für innere Medicin, 1903, No. 19.

the tissue proteids are broken down to replace food proteids, the urea and uric acid output is diminished and the ammonia is increased. Gout, however, differs from malnutrition. Here we have rather a condition of insufficient cellular resistance against the absorption of intestinal poisons or autotoxins, characterized by the production of imperfectly formed metabolites, which act on some tissues as irritants and in others excite degenerative changes which permit uratic infiltration.

Investigations on the respiratory exchanges in gout have led to but little that helps in explanation of the disease. Magnus Levy has shown that the O-intake may be increased from 5 to 10 per cent. in acute gout, but in chronic gout Klemperer and others have found but little variation from the normal. The author's own experiments have shown that the administration of nuclein derivatives has but little effect on the elimination of CO<sub>2</sub>. Thus in gout there is usually neither diminished nor retarded oxidation.

Concerning the absorption in gout, Hall makes no definite statements. Hiss and others have shown a decreasing power of absorption with advance of the disease, and increased amount of fat and unabsorbed nitrogen have been found in the stools of gouty patients. All of this nitrogen does not come from food nitrogen alone. It may arise from increased quantities of digestive secretions, from excessive epithelial desquamation, or as a result of intestinal putrefaction. The amount of cellular deficiency is of paramount importance on account of the possible passage of poisonous or imperfectly digested products into the general tissues. Proteid metabolism in gout, it is probable, differs from the normal rather in the altered affinities of the metabolites than in their quantitative excess or deficiency. The difficulties in investigation are numerous, owing to complications such as kidney insufficiency. In the acute attacks the N. output is distinctly increased, even when the food proteid is diminished. This probably results from some toxic destruction of cell protoplasm, for after the attack there is retention of nitrogen.

The metabolism of nuclein in gout has attracted much attention in recent years, as it is from this substance that the uric acid is derived. The breaking down of the nucleo-proteid results in the formation of uric acid and certain organic products called xanthin bases. The xanthin bases and the uric acid together have been termed alloxur bodies, and later still, because they all contain the nucleus C<sub>6</sub>N<sub>4</sub>, purin bodies. These bodies result from the metabolism of nuclein derived from two sources: the cells of the body, endogenous purins, and the cells taken in with the food, exogenous purin. The endogenous purins excreted in twenty-four hours vary from 0.10 gram N. to 0.20 gram N. The quantity appearing in the urine represents only a certain percentage of the total nuclein decomposed in the body, the remainder is further

metabolized by the liver cells and excreted as urea or bodies intermediate between the purin bases on the one hand and uric acid and urea on the other. Uric acid constitutes nine-tenths of the urinary purin, the xanthine bases but one-tenth. In gout the elimination of the endogenous purins is but little affected, except in the acute attack, when there is some retention. The purin bases cannot be regarded as causative in gout, but they indicate the extent of tissue toxæmia as measured by cell destruction.

The exogenous purins are rapidly removed from the body in health; in gout, however, there is a delay in excretion leading to an excess of nuclein derivatives in the blood stream. Experimental injections of hypoxanthine have been said to have produced definite tissue changes in animals, which would indicate that they possessed poisonous properties. In man the purin bases are very rarely found in excess in the blood stream. There is much conjecture as to the form in which uric acid circulates in the tissue fluids. It is probable that it circulates in several forms. Considerable evidence has been brought forth which suggests that the purin bases and uric acid exist in the blood stream in combination with a complex organic body. This is in opposition to the former belief that uric acid circulated as an inorganic urate combination.

Futcher<sup>1</sup> calls attention to the relationship between the uric acid and the phosphoric acid elimination in the intervals and during acute attacks. He questions the tendency to minimize the importance of uric acid in the etiology of gout. One thing is certain, that there is a great difference between the amount of uric acid excreted in the quiescent intervals and during the acute attacks of arthritis. There is also an intimate relation between phosphoric acid and uric-acid curves. This association seems to point toward a common cause and to suggest a common source. As during the acute arthritic manifestations the patient reported had moderate fever, the objection might be and has been raised that the increased phosphoric-acid excretion is due to the increased tissue combustion resulting from fever. In 2 of Futcher's cases the total nitrogen excretion was determined in order to see whether there was a rise in the total nitrogen excretion parallel with the uric acid and phosphoric-acid elimination. While the total nitrogen was moderately increased during the acute attack, there was no proportionate increase. Thus in 3 cases the ratio of uric-acid nitrogen to total nitrogen during the quiescent period was as low as 1 to 112 on April 12th, while on April 23d the ratio had increased to 1 to 57, showing a much greater relative increase in the uric acid than in the total nitrogen excretion. As the phosphoric-acid curve was practically parallel with the uric-acid curve, although a trifle

<sup>1</sup> Practitioner, August, 1903.

delayed, it would seem improbable that the increase in the phosphoric acid output was dependent upon general tissue disintegration, but rather upon certain tissue elements, probably the nuclei of the glandular tissues and leukocytes. The author has been able to find but little reference to the association between the phosphoric acid and the uric acid elimination in gout. Bain, in 1899, published a case showing this parallelism, and suggested the belief that nuclein disintegration was the source of both. Chalmers Watson has expressed doubt regarding this possible association. The apparent relationship between the excretion of the phosphoric and the uric acid in gout, and their relative increase during acute arthritic symptoms, together with the fact that they are both products of nuclein destruction, suggested the possibility that in an acute attack of gout there is a marked increase in the quadriurates circulating in the blood, dependent upon the sudden disintegration of the cells of the body that are rich in nuclein. The quadriurates circulating in a medium rich in sodium carbonate become converted into the insoluble acid urates which are deposited in the situations where the temperature is lowest, the circulation poorest, and the percentage of sodium chloride the highest, namely, in the cartilages and the synovial membranes. It must be admitted, however, that the increase in phosphoric acid and uric-acid elimination does not begin until a day or two after the onset of arthritic pains. The course of the leukocytes was not followed in the case here recorded.

These opinions are in line with the findings of Woods Hutchinson,<sup>1</sup> but by his interpretation less stress is placed on the importance of uric acid. Uric acid in health comes from two sources : the larger part from the nucleins and purin bases of foods, the smaller part from destructive metabolism of the nucleins of the body tissue. It is the latter alone which is increased in gout and lithæmia. These are only symptom names for miscellaneous groups of chronic toxæmic processes of widely varied origin characterized by the production of uric acid and the urates. By the gouty diathesis we mean the possession of a sufficient degree of resisting power on the part of the protective cells of the body to oppose the entrance of any poison, whatever its character or source, with consequent destructive metabolism and the production of uric acid, but not adequate to neutralize or successfully prevent its absorption. The uric acid of gout, like the phosphoric acid which accompanies it, is merely the result and measure of the destructive metabolism of the nucleins of the body cells, chiefly, it is probable, of the leukocytes in response to the invasions of poisons or toxins, organic or inorganic.

<sup>1</sup> Medical Sentinel, June, 1903.

**Etiology.** According to London,<sup>1</sup> there is an individual predisposition to the disease which is probably inherited. Along with this, a most important predisposing factor is luxurious living, particularly in the excessive use of meat and alcohol (especially champagne, port, sherry, and beer) and insufficient exercise. The same author has seen both irregular and typical cases among the poor who were unable to obtain luxuries of any kind. In this connection, Toogood's article on "Gout Amongst the Poor" is of interest. This writer doubts the occurrence of the disease among the abjectly poverty stricken, because in this case they would be unable to obtain malt liquor, which he looks upon as the immediate cause. The patient suffering from gout who comes to the infirmaries is poor because of his habits.

**Age.** In London's cases the oldest was sixty-five and the youngest fourteen years. In Toogood's patients the first attack came on most often between the ages of forty and fifty years, some as early as thirty-five years. In lead-poisoning the onset may be even earlier than this.

**Geographical Distribution.** This is of great interest. The greatest number of London's patients came to Carlsbad from England, Holland, and the United States. Fewer came from Russia, Sweden, and Norway, Denmark, Germany, and France. The smallest number from the south of France, Italy, Spain, Turkey, and Greece. The patients from India and Egypt were nearly always Europeans who possessed an hereditary tendency and had lived as *bon vivants* without much exercise. While, of course, it is impossible to draw conclusions from observations made at a health resort, this statement of London seems to show that the United States is very close to England in producing gout, a point to which Futcher called attention last year. The infrequency of gout in hot climates is explained by Crombie<sup>2</sup> on the ground that lower tissue metabolism is required to raise the temperature of the body through a smaller number of degrees and, among natives who adhere to the rules of their religion, in the less nitrogenous nature of their diet. In a temperate climate the body temperature is maintained at some 40° F. above the atmospheric temperature, whereas in a hot climate it may be only 5° to 15° F. above that of the air. Less tissue change is therefore necessary. Evidence of this lessened metabolism is found in the lower specific gravity of the urine, reaching in natives from 1008 to 1014, while the average quantity is less, averaging about 1250 c.c. The excretion of urea is lowered from over 33 grams in Europe to about 22 grams in Europeans living in a hot climate and to 17 grams in natives. We may assume that there is corresponding facility in dealing with uric acid and other products of tissue metabolism on the excess of which the

<sup>1</sup> The Practitioner, 1903.

<sup>2</sup> Ibid., July, 1903.

tendency to gout depends. The diminished liability to gout shown by Europeans in hot countries is not due to any differences in diet, as they have three meat meals a day. The native, on the other hand, lives largely on a starchy diet and shows a tendency to diabetes, which is common in well-to-do natives of over forty years of age.

**Morbid Anatomy.** This consists chiefly in joint changes associated with the deposit of uric-acid salts. The gouty deposits affect primarily the articular cartilages, then the synovial membranes and articular fibrous capsules; later the tendon sheaths and bursæ are affected, and even the periosteum of the epiphyses is involved. In a recent case, according to London, the inner aspect of the joint capsule looks as if it were dusted with sugar. Under high power these deposits are seen to be composed of needle-shaped crystals, sometimes arranged side by side, again in sheaves or star shaped. Chemically, the crystals are composed of biurate of sodium, together with sodium chloride, calcium carbonates, calcium phosphate, and sometimes hippuric acid. The above corresponds in the main to the findings of Toogood, who has noted undoubted exostoses in some of the long-standing cases. The joint fluid was often milky from suspended crystals of urate of soda. As to visceral changes, London and Toogood differ slightly in regard to the kidney findings. While the former thinks that a contracted kidney with uratic deposits is common, the latter has never been able to find deposits in the kidneys. Both agree as to the frequency of interstitial nephritis. This and arteriosclerosis are constantly found in cases which have lasted over ten years. Toogood finds that uræmia is the most frequent cause of death in gouty subjects. Nephrolithiasis is closely associated with the gouty condition, and emphysema and hepatic cirrhosis may be found post-mortem.

**Symptomatology.** The division into acute, chronic, and irregular gout remains as before. The classical symptoms of the acute attack are too well known to require repetition. The description of chronic gout as given by Toogood may be briefly mentioned.

This term is applied to those cases which, after a long series of acute attacks, have been left in a permanently crippled or maimed condition. These unfortunates may have every joint practically immovable, with enormous deposits of urate of soda in and around the joint. The formation of tophi in the cartilages of the ears is by no means universal. Many cases in which chalk stones are abundant about the joints fail to show any deposit in this situation. All cases do not, however, present the formation of chalk stones, and joints may become much distorted and absolutely stiff without the visible presence of any urate of soda. The author has never seen a stiff joint regain its movement or the deposit of urate of soda to be absorbed. The wrists and the ankles in

so-called chronic gout suggests to the touch that they are incased in a subcutaneous coating of plaster of Paris, and this is particularly the case when there are no perceptible tophi in those parts. These cases of chronic gout gradually develop signs of kidney disease and run the usual course of cardiac failure secondary to kidney affection. At no time does the urine present the pronounced characteristics of the contracted granular kidneys. Sugar is frequently present during an acute attack, particularly if the attack is the result of a prolonged drinking bout. It may become prominent during the latter stages. The author has examined many joints of patients dying of chronic kidney disease, and found crystals of urate of soda in a considerable proportion, although none had given a history of previous gout. He has also noticed in patients dying of wasting diseases, such as cancer or phthisis, the development of an acute inflammation of one or more joints. Any other such cases examined post-mortem showed urate of soda on the cartilages and in the synovial fluid of the affected joints. There was no previous history of gout in any case.

Under the head of irregular gout, that is, manifestations attributable to gout appearing elsewhere than in a joint, Toogood mentions chronic bronchitis as the most common. It is never synchronous with an attack of articular gout, is not influenced by colchicum, but rapidly disappears upon the occurrence of an articular attack.

*Palpitation* of the heart is not infrequent. It is usually associated with flatulent distention of the stomach, and yields readily to treatment.

*Eczema* is a frequent manifestation, and may be local or general; if the former, the site is determined by some special irritation. The lower third of the leg is a favorite locality, particularly if the veins are varicose. This may develop into a chronic ulcer, and there is a popular belief that so long as this ulcer remains "open" the patient will be free from attacks of bronchitis or gout, but if the ulcer heals an attack of either one or the other is certain. There is apparently some truth in this, and Toogood has seen several instances in which the healing of a long lasting *ulcus cruris* has been followed by cerebral hemorrhage. Gouty persons are also subject to attacks of *phlebitis* in the superficial varicose veins of the leg, but the condition differs in no wise from that seen in non-gouty individuals. Muscular pains and depression of spirits are noted, especially after indulgence. *Urethritis*, Toogood believes, is hardly to be considered as gouty in his patients, as their habits were such as to expose them to the ordinary gonorrhœa. *Parotitis* may occur, and *gingivitis* and *stomatitis* are common.

These are some of the forms of so-called irregular gout to which might be added many more. It is hardly justifiable to consider all conditions arising in the gouty patient as being the result of that disease

process only, and there is too great a tendency to call obscure symptoms gouty and being content with having found a name by which to tag them.

**Diagnosis.** In the articles of London and Toogood, where this point is discussed, reference is made only to the diagnosis from other joint conditions. The disease most likely to be confused with gout is osteoarthritis. In advanced stages of this latter disease the patients are subject to acute attacks affecting, chiefly, the ankle-joints and the joints of the small bones of the feet, the wrist-joint, the elbow, and, less often, the knee. The local symptoms are less marked than is usual in gout, but there is real difficulty in distinguishing between an acute attack of osteoarthritis and a subacute attack of gout. The presence of tophi helps, but these are not always present. The point to be borne in mind is that in gout the deformity is in the fibrous strictures around the joints, and that there is little or no alteration in the shape of the surfaces of the joints themselves; whereas, in osteoarthritis it is the joint surfaces and the bone in the immediate neighborhood which cause the deformity and consequent limitation of motion. The history and mode of onset is the safest guide to a correct diagnosis, as the ulnar deviation of the fingers is not characteristic. The above is hardly in accord with the conceptions of Hale White and McCrae of "acute" rheumatoid arthritis. It calls attention, however, to the widely varying ideas of chronic joint affections. Gonorrhreal and syphilitic synovitis should cause no trouble in diagnosis. The large amount of synovial fluid in the former case, together with the absence of periarticular heat and redness, sufficiently distinguishes, while the latter is only likely to be confused with tuberculous synovitis. Gout and osteoarthritis do occur together, as was well shown in a case of Toogood which came to autopsy. The patient had come under observation eight years previously to death, suffering from gout affecting the great toes, ankles, wrists, elbows, and knees. The attacks were well marked with albuminous urine. He later developed a chronic eczema, on account of which he was an inmate of the hospital for three years preceding death, which resulted from renal and cardiac insufficiency. All the joints showed signs of the fibrillated plush-like condition of the cartilaginous surfaces of the joints, together with commencing disappearance of the cartilage in patches, with erosions at the edges. The great toe-joints showed evidences of gout, with deposits in the ligaments, and tendinous expansions and patches of urate of soda were found in cartilages of the proximal phalanx of each great toe. The kidneys were typically granular and contracted; the left ventricle of the heart was greatly hypertrophied. The peculiar tapering of the fingers and the glossy skin may occur in gout as well as in osteoarthritis.

It is of interest to note that London in speaking of diagnosis mentions that long-standing rheumatism predisposes the affected articulation to gout.

If any chronic traces of the rheumatic joint disease persist they may become incorporated in the gouty changes that ensue. Thus well-known mixed forms may exist under the name of rheumatic gout or gouty rheumatism. The author also calls attention to the fact that Heberden's nodes have been proved to be of gouty nature by Pfeiffer, Potain, and Duckworth. This latter statement, however, concerning Heberden's nodes can scarcely be accepted. Charcot has proved definitely that these nodes are nothing but the small osseous tubercles found normally at the articulation of the terminal phalanges, which are enlarged by the apposition of new osseous layers. Charcot found the joint to show the changes of a dry arthritis with a velvety change in the cartilages and the articular surfaces enlarged in all directions on account of the formation of osteophytes. He could find no trace of uratic deposit.

The entire subject is still unsettled, and much study is necessary to explain the phenomena seen in these chronic joint affections. Particularly to be desired are post-mortem examinations on early stage cases.

**Treatment.** No attempt will be made to discuss the treatment of gout as carried out at Carlsbad and various other resorts of similar nature. There can be no doubt that many cases receive great benefit from a sojourn at such places, but it is difficult to say how much of this benefit depends on the virtue of the special variety of water there found and how much is due to the very strict mode of life there prescribed. In gout, as in other chronic diseases requiring restriction of diet and a curtailment of enjoyments, it is often very difficult to control the patient when at home, and sanatoria show good results largely on account of the discipline which most patients submit to without question when away from home.

**TREATMENT OF ACUTE GOUT.** This necessitates confinement to bed and local and general remedies for the relief of pain. During the acute symptoms a milk diet is generally accepted as the most satisfactory. With subsidence of the acute manifestations, which may be recognized, according to Luff, by the lessening of the pain and the appearance of pitting on pressure, other articles of diet, as fish and potatoes, and at the end of about ten days a little meat may be added. A too early return to meat or fish may bring on a relapse. Five grains of calomel or three or four grains of blue mass always begins the medical treatment, and may be followed by a saline, as Epsom salt, on the following morning. For its direct influence on gout, colchicum seems to bear the best reputation.

Toogood recommends a mixture composed of

R.—Vini colchici	.	.	.	.	.	.	.	M. xv.
Mag. carb. pond.	.	.	.	.	.	.	.	gr. x.
Mag. sulph.	.	.	.	.	.	.	.	gr. xl.
Tinct. hyoscyami	.	.	.	.	.	.	.	M. x.
Spiritus aetheris nitroosi	.	.	.	.	.	.	.	M. x.
Aque menth. pip.	.	.	.	.	.	.	q. s.	f $\frac{3}{3}$ j.

which is given every four hours until signs of abatement, when it is reduced to three times daily. Luff gives a large beginning dose of colchicum wine, 30 to 40 minims, and then 10 to 20 minims of the wine, together with 40 to 60 grains of potassium citrate three times daily. The colchicum reduces the inflammation, relieves the pain, and shortens the attack. It should be continued for some time after the acute attack, and gradually diminished. Care is necessary in its administration, as it may produce great depression. Locally, Luff advises a lotion composed of

R.—Sodii carbonatis	.	.	.	.	.	.	.	$\frac{3}{3}$ iv.
Linim. belladonnae	.	.	.	.	.	.	.	f $\frac{3}{3}$ ij.
Tinct. opii	.	.	.	.	.	.	.	f $\frac{3}{3}$ iss.
Aque	.	.	.	.	.	.	ad.	f $\frac{3}{3}$ viij.

A small portion of this is mixed with an equal quantity of hot water and poured on cotton-wool previously arranged around the joint. The pack should be changed every four hours. Toogood advises hot brine fomentations made from rock salt. The hot-air treatment was unsuccessful in his experience.

In this connection may be mentioned the latest preparation recommended for the treatment of gouty attacks. This drug is called "citarin," and is the sodium salt of hydromethyl-citronic acid, and appears as a white crystalline powder easily soluble in water. It is produced by the action of formaldehyde on the sodium salt of citronic acid. Leibholz<sup>1</sup> reports favorable results in 12 cases in which it was employed. The author advises the administration of the drug to be commenced upon the first signs of an attack in doses of two grams four times daily on the first day, to be reduced to two grams three times daily during the following days. In case the pain does not disappear promptly after the use of citarin, a morning and afternoon dose of aspirin of one gram may be given.

There are no after-effects from the citarin except a slight diarrhoea, which is hardly a disadvantage. The drug also possesses the merit of being cheap. The tablets are dissolved in a quarter of a glass of hot water, to which is added cold water or a mineral water as desired. Leibholz believes that if the remedy is taken properly an attack can be aborted. An equally favorable report comes from Fisch,<sup>2</sup> who suffered from gout

<sup>1</sup> Deutsche med. Woch., September 24, 1903.

<sup>2</sup> Ibid., December 3, 1903.

himself. Under the influence of citarin his attacks were promptly aborted and a tophus in the ear was absorbed.

**TREATMENT OF CHRONIC GOUT.** In accordance with the belief that gout is a condition in which the metabolic processes are faulty, most stress is laid on the dietetic management of the disease. Here, too, as might be expected, opinions vary as greatly as they do in regard to the pathogenesis. With the exception of Haig, who would cut off all forms of meat, tea, and fish, there is a growing belief that the proper dietary permits of a rather wide range of choice which should be suited to the needs of the individual patient. Any article of diet which is especially disagreeable to the individual is, of course, omitted, but otherwise a properly proportioned ration of the various forms of food should be advised. A brief résumé of Duckworth's article will serve to show the wide latitude of choice in food for the gouty patient. According to Duckworth, animal food is beneficial if taken in moderation. The difference between the red and white meat is nonsense. Pickled and salted meats are inadvisable, but they need not be entirely excluded from the dietary. Fish, especially white and fresh, is one of the best articles of diet for the gouty, while lobsters, oysters, and most shell fish are harmless if eaten in a good condition. No viscera need be excluded. With regard to vegetable food, ordinary bread and butter are permissible. Potatoes plainly cooked are quite harmless. Roots and vegetables grown underground, if given properly, cause no ill effect, in the author's experiences. Fruit can be taken by most gouty people, cooked or raw, in moderation, at proper times of the day and apart from the meals, with benefit. Tea, coffee, and cocoa are quite harmless. Sugar in moderation is beneficial. A purely vegetable diet would, theoretically, be the best means of averting gout; but this, however, has been condemned by physiology, and is not to be considered. Certain vegetable foods are especially useful, such as spinach, the cresses, and celery (preferably cooked). Asparagus should be taken sparingly. Respecting wines and alcoholic liquors, moderation should be the rule. The amount should be small and much attention given to the quality, season of the year, and condition of the patient. Most malt liquors are injurious. Well prepared cider is a good drink in warm weather for most gouty individuals. The quantity should not exceed a pint. The author emphasizes his belief that the choice of foods may be large, but must be suitable to the individual patient.

The dietary allowed by Luff is equally generous. He advises that the meals be plain and not to many articles of food be given at the same time. The author finds, especially among women, that too little liquid is taken, and insists on the necessity of a plentiful intake of water. He has found that certain cases of chronic gout improve and even recover on

a diet of red meat and hot water. These are generally cases of chronic gouty arthritis which are accompanied by dyspepsia, flatulence, acid eructations, pyrosis, and offensive stools. This so-called "Salisbury" treatment consists in the drinking of from three to five pints of hot water daily, which is taken from one to one-and-a-half hours before each meal and one-half hour before retiring, and in eating two to four pounds of beefsteak daily. The meat is freed from fat, gristle, and connective tissue, thoroughly minced, mixed with a little water, and then warmed through with a gentle heat until brown in color. A little salt and pepper may be added, and the meat be eaten in this form, or it may be made into cakes and cooked on the grill. Later on a grilled steak or lean mutton-chop may be added. The treatment should last from four to twelve weeks, with a gradual return to ordinary food. Any advanced kidney condition contraindicates this form of treatment. With slight kidney derangement the diet may be tried, but the urine must be examined daily, and any increase of albumin would indicate cessation of the diet. Cases with organic heart disease with failing compensation should not be placed on this form of treatment. The above refers to the diet in chronic gout or persons showing gouty tendencies.

*Medical Treatment of Chronic Gout.* In conjunction with the dietary certain drugs are thought to be of value in chronic gout. These have as an object, first, the checking of excessive formation of purin bodies. Besides regulating the food intake, the bowels should be kept open at least once daily, which tends to lessen portal congestion. Colchicum may be given in small doses, and along with it Luff advises guaiacum resin in five- to ten-grain doses two or three times a day. The colchicum may be administered as colchicine in a pill containing one-sixtieth of a grain of colchicine, combined with one-quarter of a grain of the extract of nux vomica and one grain of the extract of gentian—a pill to be taken three times daily. Colchicum is contraindicated in marked interstitial nephritis, as fatal results have followed medicinal doses in this condition. Constipation is treated by sulphur and guaiac tablets or compound licorice powder. An occasional dose of euonymin and blue pill, followed by Epsom salt, is useful. In gastric atony nux vomica or strychnine with potassium citrate is advised. In the gouty iron preparations are not well borne, but if anaemia is present the citrate of iron and ammonium or the carbonate of iron are most satisfactory.

The second object of treatment is the elimination of uric acid and other purin bodies. The citrate or carbonate of potassium should be given as a diuretic and a sufficient quantity of water be taken. The excessive use of common salt is unwise, as it interferes by diminishing the solubility of the sodium biurate.

Concerning the use of alkalies and the salts of alkalies, Luff believes

that the potassium salts, besides increasing the solvent action of the urine for uric acid salts and diminishing the acidity of the urine, both delay and inhibit the conversion of the soluble gelatinous sodium biurate into the comparatively insoluble crystalline biurate. Besides this, they stimulate metabolism and have a diuretic action. The sodium salts should be avoided when the removal of gouty deposits is the main object of treatment. In cases with sluggish hepatic action, gastro-intestinal catarrh and torpor, gouty dyspepsia, or other forms of irregular gout where the uratic joint deposits are not appreciable, mineral waters containing sodium are useful.

Luff thinks that the lithium salts are of less value than those of potassium or sodium. Besides, they possess a greater toxicity and depressing action on the heart. Potassium iodide may be of use in chronic inflammatory thickenings of the fibrous structures, in painful gout of the sole of the foot, and in gouty neuralgias. It should not be regarded as a solvent of deposits, and is contraindicated if advanced kidney disease exists. It should be given in 5- to 10-grain doses three times daily, and may be combined with 5 to 10 minims of tincture of iodine.

Locally the affected joints may be treated by massage, hot-air baths, or galvanism. Cataphoresis with a solution of potassium bicarbonate may be of value.

### DIABETES.

The investigations as to the changes in metabolism occurring in diabetes have not resulted in any noteworthy addition to our knowledge of the true nature of this disease. The later theories advocate the view that the underlying cause is an interference with the ferments concerned in glycolysis; but here, too, there exists a difference of opinion as to the source of these ferments as well as their mode of action. According to Blumenthal the glycolytic ferment is formed in all the cells of the body, and this ferment is "activated" in the organs by means of a substance secreted by the pancreas. Cohnheim's belief is much the same, and from this standpoint glycolysis could occur only through the combined action of the pancreas and other tissue. On the other hand, some observers claim that the pancreas alone is capable of producing glycolysis, while still another group deny the existence of glycolytic power in this organ. Braunstein<sup>1</sup> has endeavored to reconcile these conflicting results.

Portions of organs were taken from freshly killed animals under most careful antisepsis, freed from fat, and finely divided by a machine. A

weighed portion of this soup-like material was added to a measured quantity of a sugar solution of definite concentration. The mixture was placed in an oven at 37° C., and the percentage of sugar determined after varying periods of time.

In five experiments with pancreas a glycolysis was found in two, absent in two, and doubtful in one.

Similar experiments with fluid rabbit blood showed a slight glycolytic power in the blood which was not increased by the addition of pancreas. In the blood clot, however, there was a very strong glycolytic action which was weaker in proportion as the sugar solution was more concentrated. From this Braunstein thinks it impossible to believe that glycolysis is the result of the combined action of two substances. Braunstein believes with Lepine that the glycolytic ferment is in some way connected with the leukocytes, and by the destruction of these cells glycolysis is brought about. Experimental and clinical observations have been made which support this theory. Thus Loewy and Richter found a diminution in the glycolytic power of the blood during hypoleukocytosis, and Hahn was able to demonstrate increased glycolysis during hyperleukocytosis. Clinically it has been noted that in pneumonia occurring in diabetes that not infrequently the sugar excretion was diminished, which occurrence Braunstein thinks is due to the increase of leukocytes in this disease.

These investigations are of importance in widening our knowledge as the processes concerned in the peculiar metabolism of diabetes mellitus, but much more observation is necessary to place these theories on a firm basis.

While the theory of a glycolytic ferment in the blood seems very plausible, the methods of demonstration are by no means errorless, and many observers have questioned the reported results on this account.

Thus Bendix and Bicker,<sup>1</sup> after pointing out the very numerous sources of error, come to the conclusion that great caution is necessary in deciding as to the chemical foundations of the glycolysis theory, though they do not deny it absolutely.

*Causation.* Like other diseases of the same type, numerous predisposing causes have been thought to be active in bringing about the onset of the malady, and it has been frequently noted that there seems to be a tendency to diabetes in certain families. From the nature of the disease Lorand<sup>2</sup> does not think it probable that so marked a change in metabolism as characterizes diabetes can be the result only of a sudden change in the sugar metabolism. He believes that the dystrophy has

<sup>1</sup> Zeitschrift f. klinische Medicin, Bd. xlviii. p. 791.

<sup>2</sup> Practitioner, October, 1903.

been brought about insidiously by a long course of events. That it has been slumbering in the diabetic when he was still a child; then, owing to an irrational nourishment, probably aided by nervous influences, psychical emotions, grief, sorrow, etc., it breaks out sooner or later into active diabetes.

The first manifestations may be the presence of traces of sugar (alimentary glycosuria $\alpha$  saccharo) after the ingestion of a quantity of grape sugar (exceeding 50 grams); the next degree would be the elimination of traces of sugar after starchy food (alimentary glycosuria ex amylo); the higher degree of this pathological state is the "light" diabetes, which, owing to indiscretion in diet or, what is still worse, to a long-continued irrational dieting, can pass into the "severe" diabetes with its following acid intoxication and, finally, coma. These considerations led Lorand to the belief that in the children of diabetics a weakness in the carbohydrate mechanism might be found, and he accordingly gave amylaceous test dinners to the children of diabetic patients and afterward examined the urine for sugar.

The test dinner consisted of barley soup, beef or a thin cutlet, a plate of potatoes and one of rice, a piece of cake, a few figs, half a litre of Bavarian beer, two rolls of white bread, equivalent to a total amount of 250 to 300 grams of carbohydrates. This test meal was given to ten healthy persons, and the urine passed between two and four hours later was examined by the Trommer and Nylander tests, and were doubtful by the phenylhydrazin test of Fischer. Care was taken that no drugs were being used at the same time. The ages of the patients investigated varied between eleven and forty years, and in eight out of the ten a distinct sugar reaction was noted after the test dinner.

It would appear from this that the children of diabetics have inherited a certain defective power in dealing with sugar in their economy. This is the principal symptom of an inherited diabetic predisposition, but other symptoms were also noted by Lorand. There was a tendency to acne vulgaris, both in the years of puberty and in adults. Obesity was also frequent. Such children often show precocious puberty and often show near-sightedness after puberty, and often get gray before the usual time. All such persons are candidates for diabetes unless proper preventive measures are taken.

The theories advanced by Lorand are in line with those offered in explanation of other diseases of metabolism, and have many things to recommend them. There must be in these cases some special deficiency in the mechanism, either congenital or acquired, which renders the individual so affected unable to withstand extra strain, or in some cases even the ordinary strain of every-day life. Further investigation along this line would be of value.

**Diabetes and Carcinoma.**<sup>1</sup> The occurrence of these two diseases in the same patient is by no means common, and the cases reported by Boas are of interest. Thus Griesinger in 225 cases of diabetes was unable to find a certain case of carcinoma, and Naunyn in 400 cases of diabetes found 1 case of epithelium of the cheek, 1 case of cancer of the stomach diagnosed by section, and 6 cases diagnosed clinically. Kappler was able to collect up to 1898 in all 63 cases of combined carcinoma and diabetes, the carcinomata occurring in various parts of the body. In 366 cases of intestinal carcinoma Boas found diabetes in 12 instances, the situation of the cancer being seven times in the rectum, twice in the oesophagus, twice in the stomach, once in the liver and omentum. The diabetes was manifest in only 5 cases at the time of observation, in the others it had preceded the development of the carcinoma by a longer or shorter period. All of the patients were males. The length of time during which the diabetes had existed before the appearance of the carcinoma was impossible to determine accurately, but from the history it was thought to have existed for periods varying from two months to fifteen years. The amount of sugar varied up to 5.3 per cent. The age varied from thirty-nine years, the youngest, to sixty-five years, the oldest. Concerning the course of carcinoma in diabetes the opinions hitherto expressed have differed widely. Thus Tuffier stated that carcinoma in diabetes developed very slowly, due to the poor nutrition in these patients, which interfered with the growth and spread of the tumor.

On the other hand, Kappler and Gilbert have frequently observed a very rapid course of the tumor which they attribute to the hyperglycaemia. Boas has found that the rapidity of course depends upon the stage of diabetes present when the carcinoma makes its appearance. Thus a carcinoma developing in a patient with active diabetes runs a very rapid course. Boas had five such cases in his series. On the other hand, carcinomata developing in diabetics in whom this disease has reached a quiescent stage or has disappeared, grow very slowly, on the average more slowly than is usual for such tumors.

Concerning the effect of the carcinoma on the diabetes, it is of interest to note that such tumors have little or no tendency to produce diabetes. Even in carcinoma of the pancreas the appearance of diabetes is excessively rare. In all of Boas' carcinoma cases he has been unable to find one instance in which the diabetes was secondary to the carcinoma. With regard to the effect of the cancer on the diabetes two classes of cases may be recognized : first, those in which with the onset of the cancer there develops a surprising tolerance for carbohydrates ; and second, those in

<sup>1</sup> Berliner klinische Wochenschrift, May 26, 1903.

which the diabetes remains unchanged, except as influenced by the diminished intake of food resulting from the increasing cachexia. The reason for the marked influence in the one group and the absence in the other is not known. As to the advisability of operation in these cases, it must be borne in mind that latent diabetes may be brought into activity by even a simple operation, and the prognosis should be guarded. In manifest diabetes operation should not be attempted until the urine is sugar free, even though the time required for this may change a favorable into an unfavorable case. Cases with acetonæmia should not be operated upon. Where operation is not in question the diet should not be too strictly limited, as in carcinoma cases there is often great distaste for animal food.

It is interesting to note that in 55 cases of cancer of the rectum diabetes occurred seven times.

**Diabetes Complicating Pregnancy.** While the occurrence of a substance in the urine of pregnant women capable of reducing Fehling's solution is comparatively frequent (the frequency varying with different observers from 16 to 50 per cent.),<sup>1</sup> the development of a true diabetes mellitus during gestation is rare.<sup>2</sup> From a recent experience with such a case I was led to look up the literature on the subject.

Only those cases in which the earlier symptoms of the disease were first manifest in the gestation period are discussed; cases in which pregnancy developed in a diabetic woman I have avoided. From the literature I was able to collect 18 such cases, which, with 1 reported, make 19 up to the present time.

A brief résumé of this case is given: Mrs. X. Y., aged thirty-three years. She had always been healthy, and there was no family history of diabetes. Ten years previous she had borne a healthy child after a normal pregnancy and labor. Her health remained good, and her urine was examined in July, 1902, when she was four months pregnant, and no sugar was found. During the summer she had excessive craving for food, increased thirst, frequent urination with increased excretion, though this was not measured. She thought that these same symptoms had occurred in her previous pregnancy, but this was not certain, and the physician in attendance at that time did not find sugar. A second urinalysis in September was also negative as to sugar. In October she consulted a specialist on account of pruritus vulvæ, and her urine at that time was found to contain a considerable amount of sugar. Physical examination showed nothing markedly abnormal. She was slender, rather ashy in color, tongue coated, hands cold and a little cyanosed. The lungs, heart, and abdominal organs apparently normal.

<sup>1</sup> Hirst, Text-book of Obstetrics.

<sup>2</sup> University Medical Bulletin, October, 1903.

The urine was acid in reaction; specific gravity 1032; no albumin; 5 per cent. sugar. Microscopically there were found leukocytes, epithelium, and some oxalate crystals, but no casts. She was exceedingly nervous and rather irritable, and complained of excessive hunger and thirst.

The diet was moderately restricted, the sugars cut out entirely, and the carbohydrates partially, and she was given sodium salicylate, 10 grains four times daily. Subsequently certain unimportant additions were made to the medicinal treatment, such as a digestive capsule of *nux vomica*, soda, and extract of pancreas, and mild sedatives, as valerianate of zinc.

The pruritus rapidly subsided, and the general condition improved as pregnancy advanced. The quantity of urine was never very great and the percentage of glucose varied, but was always present until eleven days after labor. Diacetic acid and acetone were never detected, though specially looked for. Delivery was normal, and both patient and child did well.

From the summary of the 19 cases certain facts are learned. The diabetes may appear for the first time in any pregnancy, up to the eleventh in one case. The largest number (6 cases) first showed diabetes in the second pregnancy. All of the patients with one exception were under forty years. The symptoms were practically the same as in diabetes unassociated with pregnancy. Thus polyuria, increased appetite and thirst, weakness, loss of weight, boils, and pruritus vulvæ were prominent symptoms.

The prognosis from this series is less grave than Duncan, Fry, and others have held it to be. Thus in 27 pregnancies occurring in 19 women, 13 terminated normally as far as the child was concerned; in more than 6 there was abortion or miscarriage; in 7 the foetus was born dead and generally macerated, but near term; in 1 a living child was born, but died in a short time. In the same patient, previously or subsequently, non-diabetic pregnancies terminated in abortion, miscarriage, or stillbirth fifteen times. As to maternal results, among the 27 pregnancies 17 terminated in normal recovery of the mother; in 5 death occurred soon after labor, and in the remaining 5 death occurred from diabetes or other causes within some weeks or months after delivery.

The results for both mother and child are thus rather less disastrous than has generally been supposed, and careful hygienic, dietetic, and medicinal treatment should always be resorted to unless the symptoms are threatening. Increasing glycosuria, diaceturia, grave weakness, and rapidly increasing emaciation would, of course, suggest prompt termination of the pregnancy.

**Bronzed Diabetes.** Parker<sup>1</sup> reports a case occurring in a man aged sixty-five years, who first came under observation on account of a varicose ulcer of long standing. His health previously had been good, and there was no history of alcohol. He stated that he had recently lost flesh and was troubled with thirst, dyspepsia, and frequent urination. The urine was found to contain 5½ per cent. of sugar. He was treated with uranium nitrate, and later with opium, but without much success. Three months later he was admitted to the hospital. He had lost thirteen pounds, but the ulcer had healed. The complexion had an icteroid tinge. The skin was of a dusky metallic color, especially on the face, eyes, and around the site of the old ulcer. The lips and mucous membrane were grayish, but showed no marked pigment. Nothing abnormal was noted in the chest and abdomen, and there was no history of hemorrhage. The patient became comatose, and died on March 31st.

*Autopsy.* The peritoneum in the iliac region showed flecks of pigment. The surface of the liver was rough, with small nodules. The intestines were at first a yellowish gray, on exposure becoming of a uniformly leaden color. The stomach was of normal appearance, the vessels being dark gray. The kidneys showed a cortex. The pelvis was injected, but there was no discoloration. The adrenals were firm and showed no abnormality, except that the color was slightly darker than normal. The liver was cirrhosed and of a bronze color. The spleen was purplish-gray in color, weighing seven and one-half ounces and showed numerous patches of sclerosis. On section it was firmer than normal and browner in tint. The pancreas was small and firm, weighing two and one-half ounces, and contained much fibrous tissue. The color was brown, except near the head, where it was a bluish-black for a short distance. The lymphatic glands around the pancreas and the celiac axis were enlarged and of a rich golden-brown. The retroperitoneal glands below this region and the mesenteric glands were slightly tinged with brown. The glands in the axillæ and groin showed an olive-brown tinge. There was a ring of olive-brown staining in the costal cartilage, shown by a section. The bronchial glands were black, and the interbronchial glands were enlarged and of the same color as seen in the abdominal glands. No evidence of tuberculosis was found.

*Histological Examination.* The liver was cirrhotic, and numerous pigment granules were present both in the fibrous tissue and among the cells. The granules showed a marked iron reaction. A similar condition as to pigment and cirrhosis was found in the pancreas. The pigment here was chiefly in the cells of the parenchyma. The spleen was

<sup>1</sup> British Medical Journal, October 24, 1903.

fibrous, and iron pigment was found in the connective tissue, but not in the pulp. Pigment was also found in the heart and in the suprarenals. The mesenteric glands showed slight sclerosis and much pigment, more than anywhere else. Parker believes that in bronze diabetes the chief factor lies in the loss of power of elimination rather than in an abnormal amount of haemolysis. He thinks it more rational to consider the diabetes as the primary condition.

In a paper entitled "Hæmochromatosis with Diabetes Mellitus," Beattie has reported a case of the same type. From a thorough pathological and histological study of this case Beattie comes to the following conclusions :

1. The condition known as "hæmochromatosis" is a distinct entity, and the diabetes associated with it is but a late manifestation, due to a very considerable destruction of the cells of the pancreas and an increase of fibrous tissue. The degeneration in the islands of Langerhans may have a very important role in the production of the diabetes.
2. The degeneration in the cells of the liver, pancreas, and other organs, and the cirrhosis, in part are due to a toxic agent possibly derived from the intestine by way of the portal circulation.
3. The pigmentation is due partly to the degenerated cells not being able to perform their metabolic processes properly, and partly to transportation from the liver and pancreas.
4. The cirrhosis is due mainly to the toxic agent causing the cell degeneration, but one must admit that it may be due in part to the irritation caused by the pigment.

**Treatment.** The great variety of remedies and methods advocated for the treatment of diabetes is comparable to the multiplicity of theories advanced in explanation of the disease. In the face of these conflicting opinions any new remedy or method must be looked upon with doubt until it has stood the test of a prolonged trial, and up to the present no one form of treatment has given generally satisfactory results. During the past year considerable attention has been called to a treatment which has been supported by von Noorden. In his most recent communication<sup>1</sup> this author describes the procedure in detail and gives some preliminary results, based on 100 cases treated in this manner. This method consists in the use of yeast in combination with some simple form of albumin and butter. The usual diet consists of 250 grams yeast, 100 grams albumin, 300 grams butter. von Noorden prepares a soup in the following manner : The yeast (Knorr's "Hafermehl" or Hohenlohes' "Haferflocken") is cooked for a long time with water and a little salt; during the cooking are added the

butter and a vegetable albumin, such as "Roborat" or "Reiseiweiss," or, after cooking, the beaten-up whites of egg. This soup is given at two-hour intervals. The author gives four groups of cases as showing the effect of this diet on a large number of diabetics. In the first group, by this form of treatment, the urine became sugar-free and the acetone was reduced to the normal amount, and a distinct tolerance for carbohydrates was brought about; this tolerance persisted. In the second group a favorable action was obtained, and the patient improved in strength and weight, but no distinct increase in carbohydrate tolerance was obtained. Under the action of the yeast the urine was sugar-free for a time. In the third group, while the amount of sugar and acetone was diminished, the urine could not be made entirely sugar-free. The general condition improved. In the fourth group the yeast administration brought about so marked an increase in the severity of the symptoms that it had to be stopped. The action of the yeast was shown not to be dependent on the amount of sugar excreted.

These results led von Noorden to the belief that each case must be studied individually in order that a proper selection be made. This opinion is supported by the fact that the "potato" cure of Mosso, the "milk" cure, and other so-called cures have all been successful in some instances, while unsuccessful or even harmful in other and apparently similar cases. It would seem from these results that in diabetes in some cases the inability to metabolize carbohydrates was especially evident in respect to certain varieties, and that if this specially difficult form were eliminated from the diet or replaced by a more easily (for the special individual) transformed carbohydrate, definite and persistent improvement could be brought about. It is difficult to see how this idiosyncrasy could be learned, except by trial on each patient.

Einhorn,<sup>1</sup> in considering the treatment of diabetes, has pointed out the indications for diabetic and medicinal measures, and goes into detail concerning the various drugs to be used in the various conditions in which glycosurias occur.

*Indications for Dietetic Treatment Only.* All patients exhibiting the usual diabetic syndrome, and whose urine is free from acetone, diacetic and beta-oxybutyric acids, should be put on strict dietary until all the symptoms have subsided, or until all except the glycosuria, which in the meantime has declined to less than 1 per cent., have disappeared.

*Indications for Medicinal Treatment Alone.* 1. All cases systemically declining the regulation of the diet. 2. All cases in which a long-continued rigid diet cannot effect a complete cessation of the glycosuric symptoms. 3. All cases excreting less than 1 per cent. glucose in

which the patient suffers from some disorder, but does not exhibit the usual symptom-complex of diabetes mellitus. 4. Such cases in which diet has brought about subsidence of diabetic phenomena, but in which continued mental excitement is liable to effect recurrence of glycosuria.

*Indications for Both Dietetic and Medicinal Treatment.* 1. All cases in which a dietary as well as a specific hygienic treatment is indicated, and in which the patient through circumstances is prevented from properly executing them. 2. All cases exhibiting the syndrome of diabetes mellitus, but which for reasons of an accompanying affection, like chronic nephritis, for instance, cannot be kept under a rigid anti-diabetic regime.

Pseudo remedies are those which interfere with the tests for urinary glucose, and thus cause an apparent diminution. Thus Jolles has pointed out that benzosol causing levorotation interferes with the polariscope estimation. Salol, carbolic acid, benzoic acid, and salicylic acid interfere with the fermentation test, causing a lower percentage than by Fehling's. As interfering with the bismuth and copper sulphate tests, may be mentioned benzoyl-sulphonicimide and the saccharin of commerce.

*Medicinal Agents in Glycosuria Dependent on Perverted Function or the Removal of Glands or Organs.* (a) *Pancreas.* As a rule, pancreatic glycosuria is uninfluenced by medicines. An alkaline treatment may avert rapid progression, but exerts no action on the existing phenomena. Ingestion of large amounts of alkaline water by diluting the urine diminishes the percentage, but not the actual amount of sugar. Preparations of pancreas improve fat proteid assimilation ; they may prevent further systemic retrogression, or even cause increase of body weight. In a case of undoubted pancreatic diabetes associated with far advanced chronic diffuse nephritis and achylia gastrica, Einhorn was able to reduce the output of sugar from 100 grams daily to 10 to 15 grams daily by this combination :

R.—Pancreatin . . . . .	gr. xxx.	2
Trypsin,		
Foliae myrtilli pulv. . . . .	aa	gr. x.
M.—Ft. pulv. d. tal. dos. 1. (50).		1
S.—One powder three times a day.		

As the patient was on an exclusive milk regimen there was no doubt that the medication produced the glucose reduction. The subsidence of nephritis, as well as the diabetic phenomena, went hand-in-hand with the decline of the glycosuria. Trypsin was added when the pancreatin alone failed to produce results. The combination worked satisfactorily for a time, at least, in some other cases of apparent pancreatic diabetes. In two or three similar instances it was without effect.

(b) *Liver.* Glycosuria dependent on interference with the glycogenic function of the liver is best treated by dietary means. In exceptional cases, where there is acetonæmia and acidosis, or where, on account of an associated affection, a strict antidiabetic diet cannot be followed for any length of time, medication is indicated. It is here that the various alkalies and the prolonged administration of arsenic do good.

*Chionanthus virginica* has given good results in some glycosurias dependent in functional liver disease.

#### In acid intoxication:

R.—Sodii bicarbonici,							
Calcii carbonici præc.	.	.	.	.	.	aa	3 jss. 45
Sodii pyrophosphorici	.	.	.	.	.	3 ijsa.	10
M.—10 to 50 gm. daily in plain or carbonated water over a long period.							

When coma is imminent and during the comatose state 2 to 6 grams (30 to 90 grains) of precipitated calcium carbonate, suspended in water by the addition of 25 per cent. of the weight of acacia, and given by enetroclysis every two, three, or four hours, has proved useful. Mineral water may be of some value in hepatogenous glycosuria.

Salt solutions do not act directly as formerly believed, but by increasing cellular metabolism they stimulate liver activity, and there may be a greater carbohydrate tolerance.

(c) *Gastrointestinal Tract.* Chronic affections of the stomach and intestines may stand as the basis of enduring glycosuria. Where, along with glycosuria, there is a chronic or intestinal disorder this should be treated first.

(d) *Kidneys.* Phloridzin glycosuria, the association of chronic diffuse nephritis with glycosuria when the former is antedating the latter, and the frequent occurrence of glucose in renal hemorrhages, seem to point to an eventual renal origin of glycosuria.

The author has seen four cases in which glycosuria followed pre-existing Bright's disease. Dietary, chiefly milk, and medication directed toward the kidney condition brought about decided general improvement in two cases.

(e) *Other Organs.* So long as the function of diseased or extirpated organs is assumed by another organ, and thus metabolic equilibrium maintained, no glycosuria results. Einhorn has seen glycosuria occurring after ulceration and removal of the sublingual glands. A diet reduced in starch, an occasional mild ptyalagogue (drug not mentioned), and the administration of ptyaline or pancreatin kept the glycosuria in check for over two years. Later true diabetes supervened.

*Hyperthyroidism* is occasionally associated with glycosuria. In two cases seen by Einhorn thyroid therapy, arsenic, etc., were of no avail.

*Drugs in Glycosuria Dependent on Uricacidæmia and Polysarcia.*  
In the former the amount of glucose is slight.

Rigid antidiabetic treatment is contraindicated. Antilithiatic measures are usually successful. Medicines like salicylate, salol, piperazin, tincture and salt of iodine, aspirin, various alkalies, and, in a sense, also opium, probably possessed remedial qualities only when the glycosuria condition is a consequence of the gouty process.

When obesity precedes glycosuria, a diet effecting reduction of weight is imperative. Thyroid therapy, on account of its tendency to produce or intensify glycosuria, should be resorted to only under extreme circumstances. Fucus vesiculosus he has found of service in reducing obesity and its accompanying glycosuria.

*Glycosuria Dependent on Syphilitic Conditions.* Einhorn has seen two cases of this kind, one of which was cured, and the other still under observation.

Mercury by inunction or bichloride injections and potassium iodide are the drugs to be used.

*Medicinal Agents in Neurogenous Diabetes.* Chronic glycosuria occurs rather frequently in affections of the nervous system, in brain tumors, paralytic dementia, multiple sclerosis, affections of the sympathetic nervous system, traumatic functional neuroses, etc.

Generally speaking, the neurogenous type of glycosuria is the one in which medical treatment is most surely indicated. The majority of drugs employed for curing diabetes act through the nervous system. Opium and its various alkaloids, bromide, chloral, chloral amid, antipyrin, phenacetin, acetanilid, belladonna, strychnine, syzygium jambolanum, ergot, uranium nitrate, all influence the nervous system more or less.

Opium should be used only in cases which are rapidly declining to check cellular catabolism. Opium itself is better than its alkaloids.

Jambul has the greatest value of all known drugs in the suppression of nervous glycosuria.

The drug is obtainable as fluid extract of the seeds or the powdered seeds themselves. In the beginning the dose of either should be 0.75 grams (10 grains) t. i. d. This is to be increased to 10, 20 or 30 grams (150 to 450 grains) a day. As there seems to be a difference in the drug as marketed, where results are not obtained a trial of a new variety should be made.

A most thorough investigation of the most important of the various remedies hitherto advocated for the use of diabetes has been published by M. Kaufmann.<sup>1</sup> He divides the antiglycosuric remedies into (1)

<sup>1</sup> Zeitschrift f. klinische Medicin, Bd. xlviii., Parts 3-6.

sedatives; (2) antifermentatives; (3) ferments and organic extracts; (4) vegetable preparations; (5) inorganic preparations; (6) modern special preparations.

Space does not permit of detailing the numerous cases investigated nor the particulars of these investigations. The results are, briefly, as follows: The author found worthless chloral hydrate, piperazin, iodine preparations, arsenic, quinine, methylhydrochinin, myrtillus, "leinsamentee," "bohenentee," alkalies, lime salts, salts of uranium, salt of ammonia, pancreas and liver preparations, cocaine, pilocarpine, and erogotin. Likewise useless were glycosolvol, saccharosolvol, and antimellin.

As perhaps active, but, on account of the unfavorable effect upon the general organism, to be considered as dangerous, are antipyrin, carbolic acid, and sublimate. As usually ineffectual, but to be recommended in certain cases under special circumstances, are potassium bromide and Carlsbad water (as a home cure). The only remedies which show a distinct effect on the intensity of the glycosuria are opium, salicylic acid and its derivatives, aspirin and salol, and, to a certain extent, extract of jambul. Opium is only to be used in the severe cases, especially when marked nervous symptoms are present.

The salicylate preparations are particularly effectual when, under strict dieting, a small amount of glycosuria persists. The jambul extract is untrustworthy, and for its use there are no distinct indications. The author emphasizes the fact that the medical treatment can under no circumstances replace the dietetic.

Williamson<sup>1</sup> has reported favorably on the use of aspirin in glycosuria. In light cases the effect on the sugar excretion was usually favorable, but in severe diseases, especially in acute cases in young people, it was without value. The beginning dose was  $\frac{1}{2}$  gram ( $7\frac{1}{2}$  grains) three to four times daily, gradually increased to double this amount. The aspirin has the advantage over sodium salicylate that even after prolonged use of moderate amounts no bad effects were noted.

Boigey<sup>2</sup> reports good results from large doses of lime salts.

A patient, aged sixty-four years, in coma, was bled and given hypodermoclysis of sodium bicarbonate solution, but the sugar remained at 40 grams (600 grains) to the litre (1 quart). Two injections of 25 cg. of glycerophosphate of lime were given and the drug continued for months in 2-gram (30 grains) doses; under this the patient steadily improved, and the urine now contains 1 gram (15 grains) sugar to the litre. Vision improved; oedema disappeared, and muscular strength

<sup>1</sup> British Medical Journal, December 27, 1902.

<sup>2</sup> Gazette hebdomadaire de médecine et de chirurgie, October 12, 1902.

was being regained. Excellent results were obtained in two less serious cases, the dose varying from 1 to 5 grams (15 to 75 grains). The results are explained on the theory that diabetes is an intoxication with organic acids.

The appearances of large quantities of phosphate of lime in the urine of the first patient, and of a phosphate concretion in the pus of an abscess formed at the point of one injection, led to the conclusion that the larger part of the drug put into the circulation is neither absorbed nor transformed.

### **INFANTILE SCURVY.**

**Symptomatology.** Based on data gained from 65 cases observed personally, Heubner<sup>1</sup> has carefully reviewed the subject of Barlow's disease. These cases were collected over a period of twenty-six years, most of them being seen in Berlin, and a smaller portion in Leipzig. A point well worthy of comment is that over half of the cases were seen in 1901 and the first half of 1902. The general symptomatology as given by Heubner gives a very good clinical picture of the complaint.

The disease occurs practically always in nurslings. In the few cases in which older children are affected (Schödel-Nauwerck report one case, aged two years and eleven months at death) they show such a backward development that they belong actually in the category of the earlier age. At times certain diseased conditions, such as digestive disturbances, gastrointestinal catarrh, loss of appetite, great tendency to constipation or to infectious diseases, whooping-cough, pneumonia, vaccinia, chicken-pox, etc., may precede the onset of the scurvy, but in the majority of cases the child has done well up to the time of outbreak of the disease. The growth has been normal, and the weight may even be above the average. The teeth may appear at the usual time, and, if toward the end of the first year, the child may have begun to stand or to attempt to walk. Suddenly it begins to sicken, becomes irritable and peevish, and the appetite fails. At the same time in many cases it begins to show a sallow, pale, or often a cachectic appearance. The chief point, however, is the development of marked pain when moved, which is especially evident in the lower extremities. Any motion causes screaming, and the child lies by preference on its back with the knees drawn up toward the abdomen. The pain disappears quickly as soon as the child is allowed to lie quietly. It is this pain on movement that often leads to the diagnosis of rachitis.

To the pain are now added swellings which occur chiefly in the lower

extremities in the neighborhood of the joints, which may be mistaken for rheumatism, especially when there is an accompanying febrile movement. These swellings, on careful examination, are found not to be of the joint itself, but of the epiphyses, most frequently of the knee epiphyses of one or both femora, and may extend to the middle of the diaphysis. The skin over the swelling is somewhat tense and presents a more or less glistening appearance like that of many forms of edema. Gradually other epiphyseal swellings appear in the tibia and arms, leading, perhaps, to a suspicion of multiple osteomyelitis. Finally, in children who have teeth already cut, or in whom the teeth are in the process of breaking through, there appears a bloody suffusion of the gums, most frequently seen around the incisors, but which may also occur around the other teeth. This sign is never seen except when the teeth are cut or in the process of cutting.

*Analysis of the Cases.* *Age.* The youngest was five months and the oldest fifteen months. Three-quarters of 54 cases appeared in the last four months of the first year of life, and about one-eighth of the cases in each period of four months before and after that time. In 11 cases where the onset was not certainly determined 6 were in the first year and 5 from fifteen to nineteen months. From the histories given it appeared that these cases had been of quite long duration or had relapsed.

*Sex.* Thirty-nine were males and twenty-six females.

*Season.* Of 59 cases in which this could be determined the first symptom occurred in May in 15, 7 each in March, April, and June, 7 in December, 4 each in October and November. Only 1 or 2 cases appeared in each of the other months. Thus in 59 cases 36 occurred in the spring and 15 in the late fall.

*Station in Life.* None of Heubner's patients came from the polyclinic, and only a very few from the families of the rich. The great majority came from the middle classes who were in very comfortable circumstances. This rule, laid down by Cheadle years ago, has exceptions, as the patients reported by Schmorl and Nauwerck and their pupils came from the hospitals.

*Nutrition.* This was noted in 55 of the cases; 13 were fed on milk in the usual dilution, with the addition of "Graupen Schleim," or Lahmann's "Pflanzenmilch," or sugar water, without the use of the Soxhlet apparatus; 12 cases received also cows' milk in the usual dilution, but it was cooked in the Soxhlet apparatus usually for about fifteen minutes. In 19 cases, about one-half of those seen in the last year and a half, the milk was furnished pasteurized by a Berlin dairy and again cooked, sometimes in a Soxhlet apparatus and sometimes without, before being fed. The regulations as to amount and dilution were perfectly correct.

In 11 cases various forms of artificial food, some with and some without the addition of milk, had been used.

It is surprising that so few of the cases had been nourished on patent foods. Most, as can be seen, had been fed by the method generally considered the best. No suitable data could be collected that pointed toward an infection of the milk previous to its use. The one point in common with the majority of the cases was that the milk had been heated to the boiling point before being fed. It is highly probable that the heating of the milk causes some deterioration, possibly a loss of some ferment. Exact knowledge on this point is wanting.

The rapid increase in the frequency of the disease Heubner thinks is related to the increasing tendency to feed children artificially, and points to a degeneration in mothers.

**Pathology.** The symptoms above outlined were all present in 44 cases. Hemorrhages of the gums were absent in 6 cases where the teeth were cut, but these showed hemorrhages in other localities (skin, kidneys, or typical swellings). The teeth were absent in 10 cases, as were the hemorrhages. In 5 cases no notes were made concerning the teeth. In 54 cases where a distinct swelling was present this occurred over the femora alone in 33 ; affecting both femora and tibia in 14 ; tibia only in 7. The greatest swelling did not always occur over the epiphysis of the femur, as at times the diaphysis was largest. In 1 case separation of both femoral epiphysis had taken place. Swelling over the ribs and tibia are less frequent. Swelling of the cranium was noted once. From his tables the most frequent periosteal hemorrhages were noted as affecting the femur (forty-seven times), and next most frequently affected were the gums (forty-four times).

**PATHOLOGICAL ANATOMY.** Heubner accepts the findings of Schmorl and Nauwerck, according to whom the essential changes are :

1. A peculiar disturbance of nutrition of the bony system attended by a hindrance to growth and a failure in formation.
2. A tendency to the exit of blood from the vessels, affecting chiefly the bone-marrow and periosteum, but which may extend to the skin, mucous membrane, or the kidneys.

The marrow undergoes a peculiar degeneration which transforms it from a tissue rich in lymph cells and juices into a tissue of embryonal type poor in cells and bloodvessels, to which Schmorl and Nauwerck give the name of "Gerüstmark." The marrow cells are no longer able to change into osteoblasts, and the bone ceases to grow. Since periosteal growth is deficient the cortical substance becomes atrophic, showing osteoporosis. As a result at the line of ossification of the epiphysis fractures and displacements occur with the occurrence of hemorrhages into the marrow, and especially between the periosteum and cortex,

forming tumors. All the hemorrhages are not the result of bone deterioration, as Heubner has seen hemorrhages into the skin seven times, in the mucous membranes six times, and hemorrhagic nephritis six times.

**Relation to Rachitis.** In 19 cases in which this was noted 15 showed very slight changes in the thorax and forearms, 2 showed a distinct rachitis, and 2 absolutely no signs. Zeigler has divided the bone-marrow into two parts: the lymphoid central portion and the outer portion in contact with the bony substances, the endosteum. According to this author the primary lesion of Barlow's disease is in the lymphoid marrow, while in rachitis the endosteum is affected, producing an over-growth of bony tissue which does not possess the power to calcify.

**Treatment.** This is eminently successful. No medicines are required, only the proper arrangement of the diet. In children in the second year uncooked milk is given undiluted, about three-quarters to one litre daily, in five feedings. Where the undiluted milk is not well borne it may be diluted one-third or one-half with a 5 to 7 per cent. solution of Soxhlet's "Nahrzucker" or Mellin's food. Besides the milk, two or three teaspoonfuls of meat juice are given two or three times daily. Likewise a teaspoonful of fruit juice, pressed from the raw fruit, may be given after the second, fourth, and fifth feedings. Children over nine months old may be given a little mashed potato or spinach.

The chief point is the administration of uncooked milk.

### OCHRONOSIS.

This peculiar condition, first described by Virchow in 1866, may well be considered under the metabolic disorders. In all 9 cases have been reported up to the present time, the clinical history of the last 2 being given by Osler,<sup>1</sup> who was able to obtain an autopsy on the patient who died. The case reported by Virchow was in a man, aged sixty-seven years, who had died from aneurysm. The various cartilages showed a coal-black pigmentation which was different from the stain seen in melanosis. The second case, reported by Boström,<sup>2</sup> was met with in a woman, aged forty-four years, who had died of a strangulated umbilical hernia. The same ebony-black discoloration of the cartilages was noted. In 1892 Hansemann<sup>3</sup> described a third case, occurring in a man, aged forty-one years, with general oedema and aneurysm of the left ventricle. The patient had had melanuria for eighteen years.

<sup>1</sup> Osler, *Lancet*, January 2, 1904.

<sup>2</sup> Virchow's *Festschrift*, 1891, Bd. xi. 177.

<sup>3</sup> *Berliner klinische Wochenschrift*, 1892, Bd. xxix. p. 660.

Heile<sup>1</sup> reported the fourth and fifth cases, one being in a woman, aged thirty-six years, who died after a ruptured tubal pregnancy, and the other that of a woman, aged fifty-two years, with chronic leg ulcer and mitral disease. The sixth case, recorded by Hecker and Wolf,<sup>2</sup> was in a man, aged seventy-three years, with long-standing melanuria and chronic endocarditis. The sclerotics of both eyes presented black spots 3 mm. to 4 mm. from the corneal border. The urine was sometimes normal in color when passed and sometimes of a brownish color. It became black on standing a day or two. The darkening was present for eleven years, but was not constant. Blood, bile pigment, indican pyrocatechin, and drug pigments were excluded. It is distinctly stated that the urine did not reduce copper. Hecker and Wolf came to the conclusion that the reactions were those of melanuria. Autopsy showed the ordinary ochronotic blackening of the cartilages, arteries, etc. It is pretty certain that this was not a case of alkaptонuria. The seventh case was recorded by H. Albrecht,<sup>3</sup> who first suggested the association of the condition with alkaptонuria. In a man, aged forty-seven years, who had died from pulmonary tuberculosis, the urine was dark colored and reduced the sulphate of copper; but the presence of alkaptонuria was not proved, for no homogentisic acid was obtained from it. A week later he died, and the autopsy showed a general ochronosis. A point of special interest was the gray-blue color of the inner part of the ears, as if due to dilated veins.

Osler reports 2 cases of ochronosis in alkaptонuria in which the condition could be recognized clinically by the deep pigmentation of the cartilages of the ears and of the sclerotics, and in one by a remarkable ebony-black discoloration of the nose and cheeks.

Case I. The patient was a man aged fifty-seven years, first seen in January, 1895, who sought advice on account of diabetes and rapid action of the heart. After repeated examinations it was determined that the copper reducing substance was not glucose, and the case was reported as one of alkaptонuria by Futcher in 1898. At that time small V-shaped areas of pigmentations were noticed on the sclerotics, which the patient said had come on gradually. There was also slight pigmentation of the nose and on the cheeks looking like thickly set comedones, and there was a deep blue discoloration of the inner surface of the ears. The patient was seen six years later complaining of anæmia and a weak, irregular heart. The pigmentation had extended considerably. The exposed V-shaped portions of the sclerotics are of a deep black color, with occasional areas of normal hue. The staining

<sup>1</sup> Virchow's Archiv, 1900, Bd. 160, p. 148.

<sup>2</sup> Festschrift, Dresden Hospital, 1899, p. 325.

<sup>3</sup> Zeitschrift f. Heilkunde, 1902, Bd. xxiii. p. 366.

did not affect the conjunctiva or the covered portion of the sclerotic. The tarsal cartilages are not affected, and no other abnormalities are noted in the eye.

The ears look normal when seen from behind, but viewed from the inside there is a remarkable blue-black discoloration exactly like that produced by dilated veins. It is deepest in the concha, and extends along the antihelix, but not to the helix.

Over the nose and cheeks the skin is of coal-black color, very much like the butterfly distribution of lupus erythematosus. The skin is not thickened. The color suggests that produced by powder stains. Small black spots also appeared on the backs of the hands. One of this patient's sons had alkaptonuria.

**Case II.** The patient was a brother of the patient above described, his age being forty-nine years. He was one of the first cases of alkaptonuria described in America. He had been repeatedly refused for life insurance. Dr. Marshall, of the University of Pennsylvania, studied the urine carefully and called the new copper-reducing substance glycosuric acid. He, too, showed pigmentation of the sclerotics and of the ears, though not so markedly as the brother. He had noticed the pigmentation for several years.

There is no question that these are cases of ochronosis in long standing alkaptonuria, and they support Albrecht's suggestion that the pigmentation of the cartilaginous tissues is associated with the remarkable disturbance of metabolism which we have heretofore only recognized by changes in the urine.

While thus brought within range of the clinical physician, the condition is not of great importance, as in the recorded cases there have been no symptoms directly due to the alkaptonuria.

### **TUBERCULOSIS OF THE LYMPHATIC APPARATUS.**

Hitschmann and Stross<sup>1</sup> report a case occurring in a man aged twenty-eight years which resembled in many particulars the case reported by Sternberg. The history is as follows:

His parents were healthy, as was his wife. Three children were rachitic. Ten years previously the patient had a febrile disease while in Africa, on account of which he was confined to bed for six weeks. He had at that time repeated chills and bloody diarrhoea. He was treated with quinine, and apparently recovered. Since that time he has been healthy, with the exception of frequent attacks of quinsy. The present disease began in July, 1901, with pain in the left arm.

<sup>1</sup> Deutsche medicinische Wochenschrift, 1903, No. 21.

At that time a slight swelling of the glands was noted above the left clavicle, which increased in size. In January, 1902, the left leg began to have attacks of pain, chiefly in the hip, which disappeared spontaneously after a short time. For ten days previous to admission (May, 1902) he had had pain in the right hip. The glandular tumor above the clavicle extended to the left axilla.

Since the summer of 1901 the patient had had fever, night-sweats, and occasional blood-streaked sputum, and showed loss of weight. In the past six weeks there had been frequent attacks of diarrhoea, and in the winter of 1902 and 1903 a suppurating gland on the right side of the neck was opened. He denied alcoholic excess and lues.

*Physical Examination.* In May, 1902, the man was emaciated, with marked pallor of a greenish tinge, but showed no oedema or icterus. Large bunches of glands were found in the submaxillary and supra-clavicular regions, which extended into the axilla, interfering with the motion of the head and shoulder, both on account of pain and mechanical hindrance. In the chest there was found dulness over the tumor as far as the second intercostal space. Over this area rales were heard. Nothing abnormal over the right lung, except occasionally a few dry rales posteriorly. The spleen was palpable two fingers' breadth below the costal margin. The nervous system was apparently normal, as was the urine. The sputum was small in amount, contained pus, but no tubercle bacilli were found. The patient showed a mild hectic fever. The right hip could be moved in all directions, but was painful. The blood examination, May 15th, showed the red cells to be 5,540,000; white cells, 10,200; haemoglobin (Fleischl), 45 per cent. The differential count on June 5th showed polymorphonuclear neutrophiles 82 per cent.; polymorphonuclear eosinophiles, 1 per cent.: large mononuclears and transitionals, 8 per cent.; lymphocytes, 9 per cent. The tumor above the left clavicle grew larger, and oedema appeared in the left arm.

During the course of the disease the glands in the inguinal region became enlarged, and he had frequent attacks of pain in the hips, back, arms, and in various joints. Over these areas there was tenderness on pressure. From time to time he had intense itching of the skin. The cough increased in frequency, sputum also increased in amount, but at no time could tubercle bacilli be found.

The polynuclear leukocytes increased in number until they reached 40,000. Under increasing weakness and anaemia, together with considerable pain, the patient grew weaker, until finally death occurred. An autopsy showed chronic tuberculosis and hyperplasia in all the lymphatic glands of a pseudoleukæmic type, disseminated tuberculosis of the lungs, a moderate grade of amyloidosis of the liver, compression

of the nerves and vessels of the upper and lower extremities by packets of glands, hemorrhagic erosions of the mucous membrane of the stomach, and tumor-like nodules in the liver, spleen, and bone-marrow.

Histological examination of the lymph glands showed two distinct pictures. In the non-caseated glands there was a complete transformation of the normal structure. The follicles and connective-tissue trabeculae were no longer recognizable as such, the whole being transformed into more or less "Gleichformiges" tissue. The cells varied greatly, being often irregular in form and size. In addition to the leukocytes and lymphocytes and spindle cells, there were met variously formed cells, rich in protoplasm, which exceed the leukocytes in size. These cells contained either a single bladder-like nucleus, which was either round or irregular, or several small nuclei distributed irregularly throughout the cell, oftentimes in the periphery. All these nuclei stained more or less intensely with haemalaun. The number of these cells varied in inverse ratio to the number of lymphocyte cells. In the caseating glands the picture was essentially different. Along with areas similar to those described above were found foci containing many poly-nuclear leukocytes, which often showed death of the nucleus. Cells throughout these foci showed far advanced necrosis of the tissue. In these lymph glands were found numerous tubercle bacilli. In the spleen two sorts of changes were found: first, a change similar to that described in the lymph gland; and second, typical tubercles. The portions which were caseated showed numerous tubercle bacilli. In the section over the nodules seen in the liver were found remains of amyloid liver tissue, in the reticulum of which tubercles were present consisting entirely of round cells or of round and epithelioid cells.

The remaining portion of the section was taken up by the large cells, above described; thus in the liver was also found the two types of changes: first, foci with the large cell; and, second, typical tubercles. Tubercles were found in the kidney, but none of the peculiar large cells were met with. The two types of changes were noted also in the bone-marrow, and tubercle bacilli were found in both bone-marrow and the kidney.

The authors do not give any positive opinion in regard to this case. They simply state the views of Sternberg and Reed as representing the two sides of the question.

In view of the opinions offered by Sailer and others to the effect that Hodgkin's disease is always a tuberculosis of the lymphatic glands, and the equally positive statements of Reed and other observers that Hodgkin's disease is a distinct clinical entity, the diagnosis of which can be made from the cut section, this case is particularly interesting. The

whole subject was gone into very thoroughly in last year's *PROGRESSIVE MEDICINE*, and the case now reported seems to verify the statement then made.

My own view regarding the tuberculous nature of Hodgkin's disease has always been that certain cases of tuberculous lymphadenitis are clinically indistinguishable from true Hodgkin's disease; that in some instances of Hodgkin's disease terminal or intercurrent tuberculous infection may occur, but that the tuberculous nature of the great majority of cases is, to say the least, unproved.

# OPHTHALMOLOGY.

BY EDWARD JACKSON, M.D.

## DISEASES OF THE CONJUNCTIVA.

**Bacteriology.** The eye has played a most important role in the earlier investigations of the pathology of inflammation, and it seems destined to occupy an equally prominent place in the study of bacterial invasions. Its behavior toward bacterial toxins has been considered in preceding years.<sup>1</sup> There are also accumulating important observations regarding the identity or relationship of certain forms of bacteria, and the similarity of the symptoms associated with the presence of widely different species.

The relation of the diphtheria bacillus to the xerosis bacillus is still uncertain. Bietti,<sup>2</sup> while admitting this, thinks that in very rare cases virulent diphtheria bacilli may be found in the normal conjunctiva, but he concludes that the xerosis bacillus is never a cause of catarrhal conjunctivitis. On the other hand, it cannot be questioned that other good observers have found only the xerosis bacillus present in cases of acute conjunctivitis. Randolph<sup>3</sup> found the xerosis bacillus alone in repeated cultures from acute conjunctivitis. He has, also, more than once been forced to the conclusion that the white micrococcus of the skin, so frequently found in the normal conjunctival sac, was the cause of an intense conjunctivitis.

It seems certain that a form of acute contagious conjunctivitis may be caused by the influenza bacillus. Ten cases taken from two separate epidemics are reported by zur Nedden,<sup>4</sup> and three cases are reported by Wynekoop.<sup>5</sup> Clinically, the cases were marked by confinement of the inflammation to the conjunctiva, and chiefly to the palpebral portion. The discharge was mostly thin and watery, although in the more severe cases it was purulent. The yellowish crusts on the lid margin, so characteristic of the Koch-Weeks bacillus conjunctivitis, are not mentioned; and they were conspicuously absent in a case of the kind that I

<sup>1</sup> PROGRESSIVE MEDICINE, June, 1900, and June, 1903.

<sup>2</sup> Klin. Monatsbl. f. Augenh., 1903, supplement.

<sup>3</sup> Transactions of Section on Ophthalmology, American Medical Association, 1903.

<sup>4</sup> Klin. Monatsbl. f. Augenh., March, 1903.

<sup>5</sup> Journal of the American Medical Association, February 28, 1903.

have recently seen. Axenfeld,<sup>1</sup> in discussing the differential diagnosis, considers only the pathology and bacteriology of the question, and reaches the conclusion that the two organisms are closely related to each other and to Mueller's bacillus.

Among the organisms that exceptionally cause conjunctivitis, Axenfeld discusses the colon bacillus, the intracellular meningitic ozæna bacillus of Loewenberg, and Friedländer's pneumobacillus. It is worth noting in passing that Axenfeld in his treatise, which is bacteriological rather than clinical, adheres largely to the clinical basis of classification.

**Trachoma.** Axenfeld, while considering trachoma among the bacterial diseases, describes no specific organism as the cause. He accepts the view that the epidemics of trachoma usually have the character of mixed infections, the Koch-Weeks bacillus being very frequently found in the acute cases. However, Mueller,<sup>2</sup> in a very elaborate paper, based on researches extending over several years and carried on at various places in Austria and Egypt, announces as the cause of trachoma a bacillus with rounded ends, with a diameter slightly greater than that of the Koch-Weeks bacillus, and twice this length. It gives a negative reaction with Gram's stain, is immobile, and grows only at the body temperature, on a culture medium containing haemoglobin, in the presence of oxygen, and in colonies with a perfectly structureless margin, all other characters being variable. The rods are generally found outside the cells, in the mucous portions of the discharges.

**TREATMENT OF TRACHOMA BY THE  $\alpha$ -RAY.** In the treatment of trachoma a real advance seems to have been made in resorting to the use of the  $\alpha$ -rays. Mayou<sup>3</sup> points out that by this means it is possible to set up a leukocytosis of any desired degree, with a minimum of injury to the epithelium. Although under this treatment the granules disappear rapidly, the more severe cases may well be submitted to operation (rolling the lids). For exposure to the  $\alpha$ -ray, Mayou's procedure is as follows : The upper lid is everted, and the lower lid pushed up to cover as much of the cornea as possible, except in bad cases of pannus, when the cornea also may be exposed. At first he used a mask to cut off all except the diseased portions from the influence of the rays. But this he subsequently discarded, the exposure causing no sign of corneal or retinal trouble, and no reaction of the skin. The patient was placed nine inches from the anode, and a moderately "soft" tube used with a current of six ampères. A two minutes' exposure was given on four to six successive days. Then there was a week's intermission, after

<sup>1</sup> Spezielle Bakteriologie des Auges, Handbuch der pathogenen. Micro-organism., Kolle und Wassermann, Jena, 1903.

<sup>2</sup> Graefe's Arch. f. Ophthalmol., Bd. lvii., Heft 1.

<sup>3</sup> Lancet, February 28, 1903.

which exposures were made one to three times a week until the granules disappeared entirely. After that several weeks had to elapse before it could be ascertained certainly that the case was completely cured. The chronic cases were more satisfactory, and stood more frequent exposures than the more acute cases. In the first cases treated there was some trouble from falling of the lashes and conjunctivitis ; but in the later cases, some fifteen in number, there had been no similar trouble.

Stephenson and Walsh<sup>1</sup> employed a "hard" tube (requiring a seven- or eight-inch spark), with the anode eight inches from the eye, and a current of five ampères ; but their exposures were prolonged to ten or fifteen minutes. They found that eversion of the lids made no difference in the effect produced. In one case they produced a decided dermatitis, on account of which a lead mask was subsequently employed. In three of their cases but one eye was subjected to the treatment. Its fellow being treated according to the older methods remained practically unchanged, while the eye exposed to the *x-ray* improved rapidly.

Bettremieux<sup>2</sup> obtained similarly favorable results by exposures of one minute, four or five times a week, for five or six weeks. He used a current of three to four ampères, with a tube placed at four to ten inches from the eyes.

**Vernal Conjunctivitis.** This is a rare disease. Posey,<sup>3</sup> upon inquiry among American ophthalmologists, found it occurred about once in two hundred to five hundred cases of conjunctival disease, and was exceedingly uncommon in New England, the Northwest, and the highlands of all the States. It is most common between the ages of six and sixteen years. As to treatment, he found no general agreement upon any measure as especially reliable, but noted that Starr and Bennett, of Buffalo, had obtained benefit from exposures of the conjunctiva to the *x-rays*.

A very striking case of cure, at least for one season, by the use of *x-rays* is reported by Allport.<sup>4</sup> The patient, aged nineteen years, had suffered for seven years, during which time she had consulted several specialists, both in America and Europe ; and she had been treated previously, according to the usual methods, by Allport himself. At first the exposures were made cautiously, but later were prolonged to about ten minutes. The improvement in the subjective symptoms was immediate ; and gradually the palpebral growths, which had been very marked in this case, diminished, until they entirely disappeared, after some eighty exposures.

<sup>1</sup> Medical Press and Circular, February 18, 1903.

<sup>2</sup> Recueil d'ophtalmologie, July, 1903.

<sup>3</sup> Journal of the American Medical Association, July 25, 1903.

<sup>4</sup> Ophthalmic Record, October, 1903.

A suggestion as to the *pathology of vernal conjunctivitis*, which may throw some light upon the benefit derived from the use of *x-rays*, is made by Herbert.<sup>1</sup> He has found the granular, round or oval cells, making the mass of the infiltration in the tissue, to be chiefly eosinophile corpuscles. In the exudation that is quickly produced by irritation of the conjunctival surface, eosinophile cells were also found in very large numbers. In one-half dozen cases studied from this point of view, the eosinophile cells amounted to 10 to 20 per cent. of the total leukocyte count. Their presence in large numbers had also been utilized in making a diagnosis. Burnett<sup>2</sup> has emphasized the point that vernal conjunctivitis is always a hyperplastic condition. This is borne out by all anatomical investigations of it, including the latest by de Schweinitz and Shumway.<sup>3</sup> He also points out its opposition to trachoma in this respect, and in its frequency among negroes, who are almost free from trachoma, while among the Russians, who suffer greatly from trachoma, vernal conjunctivitis is extremely rare.

**Tuberculosis of the Conjunctiva** has almost invariably been reported as occurring in childhood or early youth. But Terson<sup>4</sup> presented to the Ophthalmological Society of Paris a patient, aged seventy-one years, suffering for several months from ulceration of the tarsal conjunctiva and swelling of the preauricular gland. Inoculation of a guinea-pig with a fragment of the conjunctival tissue demonstrated the character of the lesion.

The treatment usually advised in this condition is thoroughly radical. Berry,<sup>5</sup> in the case of a girl aged ten years, with slight inflammation of the conjunctiva of both lids and a number of grayish patches, removed the whole of the swollen conjunctiva, dissected out the submaxillary gland, and where there was subcutaneous swelling of the facial lymphatics opened them and scraped them out. It is doubtful whether such measures are necessary or any longer justifiable. Stephenson<sup>6</sup> reports a case occurring in a girl aged four years, where the disease had lasted two months, and the lesions were more decided than in Berry's case. The character of the disease was proven by inoculation in a rabbit's eye. *x-ray* exposures were made as for trachoma (see above), and after nine exposures, in the course of a month, the conjunctival disease was practically cured.

Henderson<sup>7</sup> reports a case in a girl, aged twenty years, who had been

<sup>1</sup> The Ophthalmoscope, November, 1903.

<sup>2</sup> American Journal of the Medical Sciences, February, 1904.

<sup>3</sup> University of Pennsylvania Medical Bulletin, June, 1903.

<sup>4</sup> Recueil d'ophtalmologie, March, 1903, p. 132.

<sup>5</sup> Edinburgh Medical Journal, May, 1903.

<sup>6</sup> British Medical Journal, June 6, 1903.

<sup>7</sup> Annals of Ophthalmology, July, 1903.

treated for trachoma, including the use of Knapp's roller forceps. Tumefaction of the lid had slowly increased. After excision of two pieces of tissue for microscopic and bacteriological examination, and removal of the preauricular gland, no further local treatment was attempted. The patient was sent to Colorado and placed upon the general treatment for tuberculosis, and within a year the eye had entirely recovered. I have reported a case<sup>1</sup> in which the only local treatment was the use of iodoform ointment, 25 per cent., and a wash of trikresol, 1 : 1500. The eye has remained apparently cured for nearly a year.

**Fatal Hemorrhage from the Conjunctiva.** Hemorrhage from the conjunctiva is one of the rare dangers from the use of silver nitrate, in the prevention or treatment of purulent conjunctivitis of the newborn. Wiener<sup>2</sup> reports a case in which the hemorrhage was fatal. It commenced after the use of two drops of a 2 per cent. solution of the nitrate in each eye, to prevent ophthalmia. The bleeding continued until the child's death, on the seventh day. Post-mortem examination showed the organs to be normal and no internal hemorrhages. A similar case<sup>3</sup> has already been referred to in these pages. Wiener concludes that in his case the silver nitrate was the occasion, but that a predisposition of the child to bleed was the cause of the accident.

### DISEASES OF THE CORNEA.

**Treatment of Corneal Ulcer.** In the University Eye Clinic at Bonn, the treatment for corneal ulcers is given by Hermann<sup>4</sup> as follows: Small ulcers with slight hypopyon, which are not extending, are treated with atropine, hot fomentations, and frequent irrigations with solutions of boric acid or 1 : 5000 of mercuric chloride or oxycyanide. If the ulcer be extending or the hypopyon large, the actual cautery or, by preference, the Saemisch incision is resorted to.

Donovan,<sup>5</sup> who has to treat many ulcers of traumatic origin, found the electrocautery so satisfactory as a remedy of last resort that he has come to rely upon it as the chief means of treatment. Simple ulcers are not subjected to it; but slight wounds showing irritation after twenty-four hours are lightly touched with the cautery, at a dull-red heat. For more severe injury or a wound already suppurating, the surface is first cleaned with a curette, and then the cautery applied,

<sup>1</sup> Ophthalmic Record, September, 1903.

<sup>2</sup> American Journal of Ophthalmology, March, 1903.

<sup>3</sup> PROGRESSIVE MEDICINE, June, 1900.

<sup>4</sup> Klin. Monatsbl. f. Augenh., October, 1903.

<sup>5</sup> American Journal of Ophthalmology, October, 1903.

not to the whole surface, but to points along the margin of the ulcer, from  $1\frac{1}{2}$  mm. to 3 mm. apart, and to any portion of the floor which appears unhealthy. This method, he says, originated with Knapp. Instead of sealing up the whole surface of the ulcer, it leaves the natural drainage free over a large part of it. Donovan holds that whenever a corneal wound or ulcer is severe enough to require treatment, the electrocautery is indicated.

On account of the general importance of serum therapy even the meagre results reported with it in the last year deserve mention. Darier<sup>1</sup> reports a single case of streptococcus infection, with ulceration of the cornea, in an infant, in which, after the failure of treatment by silver nitrate and protargol, rapid improvement followed the injection of Roux's serum under the skin of the abdomen. Two days later the injection was repeated, and prompt recovery followed.

Calderaro<sup>2</sup> has employed the Tizzoni-Panichi *antipneumococcic serum*, which he prefers, both on account of its superior strength and because it can be kept as a powder and prepared for use by the addition of water. He made subconjunctival injections of three-fourths of a Pravaz syringeful on alternate days, with instillations of the serum into the conjunctival sac every two hours. In cases treated thus, beginning by the fourth to the sixth day of the disease, the cure was rapid.

The case cured by exclusion of *actinic light*, reported by Lowe,<sup>3</sup> has been widely quoted. It is said to have been a case of ulceration of the cornea, with intense photophobia. The patient had been confined to a darkened room. On being placed in a room, the windows of which were covered with photographers' red paper, the photophobia and pain immediately disappeared. Next day hyperæmia, lacrymation, and discharge had ceased, and on the third day the patient could read and sew. "No sign of ulceration could be seen." Probably this case should be included among the ocular manifestations of *hysteria*; but it may do more good to mention it here.

**Ring Abscess of the Cornea.** Fuchs<sup>4</sup> reports nine cases of this disease. It appears suddenly, following a penetrating wound of the eyeball, or without any wound whatever; but not from a superficial injury. It is characterized by a ring of purulent infiltration, parallel to the margin of the cornea, and 1 mm. or more within it. The chief portion of the infiltration is in the superficial layers of the cornea, but a second zone involves the deepest layers. The zones of infiltration do not contain any large number of bacteria, but great quantities are found

<sup>1</sup> *La clinique ophtalmologique*, March 10, 1903.

<sup>2</sup> *La clinica oculistica*, August, 1903.

<sup>3</sup> *Intercolonial Medical Journal of Australasia*, March 20, 1903.

<sup>4</sup> *Graefe's Arch. f. Ophthalmol.*, Bd. Ivi., Heft 1.

within the eyeball; and such cases are very likely to terminate in panophthalmitis. Fuchs found various bacteria, no one of which was held responsible for the disease.

Hanke<sup>1</sup> reports a single case following injury to the cornea by a splash of hot machine oil. When seen, two weeks later, there was the usual ring-shaped infiltration, with hypopyon. In both the hypopyon and in scrapings from the cornea he found a bacillus 0.8 to 1.6 $\mu$  in length and 0.3 $\mu$  thick. This grew in bouillon and on various agar media, and rapidly liquefied gelatin and blood serum. It was rapidly fatal to mice, but not to rabbits and guinea-pigs. Fresh cultures introduced into the cornea of the latter caused ring infiltration and panophthalmitis.

**Interstitial Keratitis.** Stephenson<sup>2</sup> reports three cases probably due to acquired syphilis. One was of the punctate form described by Mauthner. The second was unilateral, but had the usual characters exhibited by the disease when due to hereditary syphilis, the vascularization of the cornea being at one time particularly marked. The third case occurred in a girl, aged twelve years, who probably acquired syphilis when two or three months old. He points out that such an origin may be more frequent, for the cases occurring in children, than is usually realized. These cases all yielded promptly to mercurial treatment.

**INTERSTITIAL KERATITIS OF TUBERCULOUS ORIGIN** is found by Desvaux<sup>3</sup> almost always to present whitish deposits in the lower part of the cornea, which, with the general symptoms and absence of the stigmata of inherited syphilis, may be relied upon for the diagnosis. He finds the usual treatment with iodides, phosphates, and cod-liver oil gives excellent results, usually bringing about a cure much more rapidly than it can be effected when the keratitis is due to syphilis.

To this latter point we must not attach too much importance. Some of the most obstinate cases I have encountered were tuberculous in their origin; and one reported by Darier<sup>4</sup> well illustrates the type, while it gives such encouragement as a single case can of better results from a new line of treatment. Darier's patient, a girl aged thirteen years, one of a family of eight, of whom but one was dead, and from tuberculosis, had no signs of syphilis. She had typhoid fever, and then repeated inflammations of the right eye, until in a year sight was destroyed. After that the left eye became affected. Under varied and active treatment this eye also went from bad to worse. Darier now resorted to subconjunctival injections of tuberculin T. R.,  $\frac{1}{70}$  milligram. The

<sup>1</sup> *Zeitschrift f. Augenh.*, November, 1903.

<sup>2</sup> *The Ophthalmoscope*, November, 1903.

<sup>3</sup> *La clinique ophtalmologique*, June 25, 1903.

<sup>4</sup> *Ophthalmic Review*, December, 1903.

local reaction was most violent ; but there was no rise of temperature. In twenty-four days vision had risen from  $\frac{1}{20}$  to  $\frac{1}{5}$ . Three additional injections of  $\frac{1}{10}$ ,  $\frac{1}{5}$ , and  $\frac{1}{3}$  milligram were given, and vision rose to  $\frac{1}{2}$ . An attempted paracentesis was followed by diminished vision. But the final result was : Vision, right,  $\frac{1}{5}$ , left,  $\frac{1}{8}$ —a very excellent one for a case of this class.

Interstitial keratitis is probably not very rare after smallpox, although Baker<sup>1</sup> mentions no case among his twenty-three cases of corneal disease occurring in the Cleveland epidemic. A case is reported by John Green, Jr.,<sup>2</sup> in which both eyes were involved. There was no ulceration, and vision of  $\frac{1}{80}$  was regained in about two months. I have seen a case<sup>3</sup> affecting but one eye, in which vision improved in two months, from counting fingers to  $\frac{4}{60}$ .

FIG. 45.



Hereditary "lattice-form" of cornea  
following injury. (FREUND.)

FIG. 46.



"Lattice-form" opacity of cornea  
following injury. (CASPAR.)

Interstitial keratitis complicating *ophthalmia neonatorum* is reported by Hubbell.<sup>4</sup> The corneal opacities commenced on the fourth day of the disease without any abrasion, and in one eye without the use of applications that could be blamed for such a symptom. The conjunctivitis had quite subsided in five weeks ; but the corneal inflammation reached its climax in about two months. In two years there was noticeable improvement in one eye, and after four years in the other. At ten years old vision was  $\frac{2}{60}$  with one, and counting fingers at one-half metre with the other.

**Opacities of the Cornea.** The "lattice-form" opacity of the cornea, first described by Biber in 1890, is undoubtedly hereditary, and affects both males and females in direct descent. Freund<sup>5</sup> reports fifteen new cases occurring in two families. It appeared in one family in

<sup>1</sup> Transactions of Section on Ophthalmology, American Medical Association, 1903.

<sup>2</sup> American Medicine, July 11, 1903.

<sup>3</sup> Denver Medical Times, December, 1901.

<sup>4</sup> Transactions of American Ophthalmological Society, 1903.

<sup>5</sup> Graefe's Arch. f. Ophthalmol., Bd. lvii., Heft 2.

three and in the other in four generations. It appears at puberty, the youngest case being a boy aged thirteen years, in whom it was just beginning. It reaches its full development by the age of thirty or forty years, and continues throughout life. It comes on so gradually that the impairment of vision is not at first noticed; and there are no other subjective symptoms. The opacity consists of fine, gray lines, branching and crossing at oblique angles, with little nodules of gray interspersed among them. (See Fig. 45.) It is most dense in the central portion of the cornea, and the marginal zone always remains quite clear. No cause other than heredity has been recognized.

Caspar<sup>1</sup> reports three cases of "lattice-form" opacities following injuries to the cornea. One case was injured by a spurt of molten solder, the others by flying splinters of iron, one of them being chiefly a bruise, the other a perforating wound. The gray interlacing lines, shown in Fig. 46, appeared within a few days, and disappeared entirely in six or eight weeks.

Corneal scars are particularly liable to degenerative changes, by which they become more opaque in old age. In rare cases an actual deposit of lime salts may occur. Moulton<sup>2</sup> reports two cases of calcareous degeneration of corneal cicatrices—adherent leucomata. In a man aged sixty-two years the scar was of thirty-six years' standing. In a woman aged twenty-six years the damage to the cornea had occurred at the age of three years. In both cases the offending chalky plate, some 2 mm. across, was dug out of the cornea. This was followed by prompt healing, and in the younger patient it gave relief from symptoms of irritation that had lasted for two years. No such symptoms had been present in the other case.

*Peritomy* is an old operation which has recently been revived. Snell<sup>3</sup> has used it in about one hundred cases of diffuse keratitis, and thinks it of especial value in that condition. Elliot<sup>4</sup> has employed it in pannus due to trachoma, with great advantage. Fox<sup>5</sup> insists on the importance of removing a wide (5 mm.) strip of tissue surrounding the cornea; and for such an operation uses the more appropriate term *peridectomy*. He holds that it is an operation for which there is no substitute. The principal indications are pannus, corneal ulcers, and interstitial keratitis.

<sup>1</sup> Klin. Monatsbl. f. Augenh., October, 1903.

<sup>2</sup> Journal of the American Medical Association, October 31, 1903.

<sup>3</sup> Lancet, May 30, 1903.

<sup>4</sup> Ibid., June 6, 1903.

<sup>5</sup> Annals of Ophthalmology, October, 1903.

**DISEASES OF THE UVEAL TRACT.**

**Rheumatic Iritis.** While rheumatism is usually placed next to syphilis in the list of causes to which iritis is ascribed, it has often been noted that inflammation of the iris rarely attends acute articular rheumatism. Hartridge<sup>1</sup> says he never has seen any such case. I remember to have seen but one. Yeld<sup>2</sup> analyzed one hundred and fifty-nine cases of primary iritis, with especial reference to causation, and in no single instance was the evidence of true rheumatism conclusive. Neither did he find iritis associated with chorea, and in only four cases with heart disease. Nevertheless, the cases associated with chronic disease of the joints were very common. These cases he is inclined to assign to gonorrhœa and syphilis. Still, iritis with acute rheumatism does occur. A case is reported by Forster<sup>3</sup> of a girl, aged twelve years, who had suffered from tonsillitis, arthritis, chorea, endocarditis, and iritis, which twice relapsed.

Poynton<sup>4</sup> offers an explanation of the pathogenesis of such cases. He and Paine had isolated a diplococcus obtained from the cardiac valves, pericardial exudates, a rheumatic nodule, the blood, the tonsils, synovial fluid, and urine of fatal cases of rheumatic fever. Cultures of the diplococcus, injected into the veins of rabbits, caused arthritis and death by heart disease; and in two instances iridocyclitis and clouding of the aqueous, which teemed with the diplococcus. The culture from the fluid, injected into another rabbit, produced a chronic arthritis. They believed they had produced a true experimental rheumatic iridocyclitis. The tendency of other infections allied to rheumatism to cause iritis is pointed out. The gonococcus and the pneumococcus are especially liable to cause it; while the streptococcus is more prone to give rise to a general infection—panophthalmitis.

**Gonorrhœal Uveitis.** In a series of cases of ocular disease caused by the gonococcus, Galezowski<sup>5</sup> reports panophthalmitis, suppurative iritis, and two each of iritis, with posterior synechia and iridochoroiditis. Should the term rheumatism be restricted to the specific disease, it is probable that the relative positions usually assigned to gonorrhœa and rheumatism, as causes of iritis, should be reversed. In one of Galezowski's cases vision was lost by a necrosis of both corneas; but in the others partial or complete recovery occurred under treatment. This illustrates the general tendency of these ocular lesions of gonorrhœa.

<sup>1</sup> Ophthalmic Review, July 1903, p. 203.

<sup>2</sup> British Medical Journal, March 14, 1903.

<sup>3</sup> Ibid., March 7, 1903.

<sup>4</sup> Recueil d'ophtalmologie, June and July, 1903.

<sup>5</sup> The Ophthalmoscope, October, 1903.

**Occlusion of the Pupil** by plastic exudate occasionally occurs in severe iritis, and demands close attention. Young<sup>1</sup> reports a case in which the whole pupil, somewhat dilated by mydriatics, became filled with an inflammatory membranous mass, which extended beyond the limits of the pupil, with filamentous attachments to the iris. The patient was put upon sodium salicylate to the extent of 100 grains per day, and within two weeks the exudate had been entirely removed, and a week later vision was  $\frac{1}{100}$ , the vitreous still being slightly hazy. Such a result is not attained without active treatment.

Rumschewitschs<sup>2</sup> reports the microscopic appearance in an eye, in which such a membrane extending on the anterior surface of the iris had become organized. The inflammation causing the membrane had occurred ten years previously, lasting four months, and leaving the eye quiet but blind.

**Panophthalmitis.** Panophthalmitis in *typhoid fever* is reported by Gilfillan.<sup>3</sup> The inflammation of the eye was first noticed on the twenty-sixth day of the disease. There was hyperæmia and swelling of the lids, conjunctiva, and orbital tissue, with but little discharge. The case terminated in shrinking of the eyeball. This seems to have been an instance of the lowered ability of damaged tissue to resist disease. The eye had been blind from a previous injury.

Two cases of metastatic disease are reported by Liebrecht.<sup>4</sup> In one the eye became involved fourteen days after an infected wound of the chest, and was enucleated two days later. It proved to be a streptococcus infection. The other case occurred as a part of general sepsis, following a boil on the forehead. The patient's death occurred before the globe had been extensively involved. But foci of staphylococcus infection were found in the choroid.

The subject of endogenous infection of the eye has been studied experimentally by Selinskowsky and Woizechowsky.<sup>5</sup> They find it possible, experimentally, to induce the entrance into the vitreous of bacteria circulating in the blood. These entered the vitreous through the retinal and choroidal vessels, and entered the aqueous through the ciliary vessels. Although inflammatory symptoms might be absent, phagocytosis, directed toward their destruction, was always present when bacteria had entered the eye.

Under certain circumstances severe inflammation of the eye was induced by endogenous infection. Without very severe general infec-

<sup>1</sup> Ophthalmic Record, May, 1903, p. 220.

<sup>2</sup> Klin. Monatsbl. f. Augenh., November and December, 1903.

<sup>3</sup> Medical News, July 25, 1903.

<sup>4</sup> Klin. Monatsbl. f. Augenh., August, 1903.

<sup>5</sup> Archives of Ophthalmology, September, 1903.

tion, bacteria entered the vitreous only if the eye had been injured shortly before. Injury to both anterior and posterior portions was most favorable; injury to the posterior portion alone next; and in far less degree an injury to the anterior portion. With more severe general infection, bacteria circulating in the blood entered the vitreous of normal non-irritated eyes. (See, also, Ocular Lesions of General Diseases.)

**Uveal Tuberculosis.** Tuberculosis of the iris is probably rare. Most observers agree with Grosz<sup>1</sup> that it occurs once or twice in each 10,000 cases of eye disease. This, of course, does not include the form of iritis claimed to be tuberculous by Michel, to which I referred last year.<sup>2</sup> Grosz reports one case in which the diagnosis was confirmed by microscopic examination of the enucleated eye. If operation is to be done, he regards enucleation as safer than excision of a portion of the iris. That the latter may be resorted to, however, for purposes of diagnosis is suggested by Wilder.<sup>3</sup>

The removal of a piece of iris in a case of some duration may, however, be quite difficult. It was attempted by Weill,<sup>4</sup> who, failing to accomplish what he desired in that direction, introduced sterilized iodoform freely into the anterior chamber. Marked improvement in the condition of the eye followed this; and vision was improved from ability to note the direction of shadows, to counting fingers at seven or eight feet. It might be claimed that the benefit following the introduction of iodoform in this and similar cases was really due to some introduction of atmospheric air, as practised by Koster.<sup>5</sup>

In uveal tuberculosis, as in tuberculosis elsewhere, the general treatment is of very great importance. Jessop<sup>6</sup> reports two cases which enforce this point. In a girl, aged nine years, a mass had been removed from the right sclerotic, the tuberculous nature of which was proved by inoculation of a guinea-pig. At this time there were two large detachments of the retina, evidently produced by some solid material, and vision was reduced to perception of large moving objects. After eighteen months of open-air treatment vision had improved to  $\frac{1}{8}$  partly, and the retinal changes were rapidly clearing up. His other patient was a woman, aged twenty-five years, who had suffered from a mammary cyst, which had been found to contain tubercle bacilli. A mass was found in the choroid, just above the optic disk. This completely disappeared, leaving vision  $\frac{1}{2}$ . The patient was under observa-

<sup>1</sup> Pester Medicin. Chirurg. Presse, February 6, 1903.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1903.

<sup>3</sup> American Journal of Ophthalmology, October, 1903.

<sup>4</sup> Ibid., April, 1903.

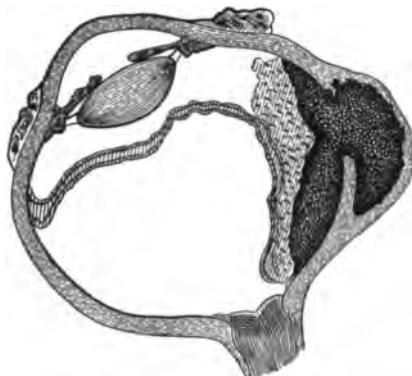
<sup>5</sup> PROGRESSIVE MEDICINE, June, 1903.

<sup>6</sup> Transactions of Ophthalmological Society of the United Kingdom, May 8, 1903.

tion three and one-half years. Two other cases of tuberculous growth of the choroid, in addition to Jessop's first case, involving and breaking through the sclerotic, are reported by zur Nedden.<sup>1</sup> One of these is shown in Fig. 47.

Tubercle of the choroid is most frequent in general acute miliary tuberculosis. Probably it is present before death in 50 per cent. of such cases. Loeb<sup>2</sup> reports a case in which the choroidal lesion enabled him to differentiate this disease from typhoid fever, and his diagnosis was confirmed by post-mortem examination. There was no history of tuberculosis, and no tubercle bacilli were found in the sputum, blood, or feces. On the other hand, the Widal and diazo reactions were negative and the temperature atypical. Loeb urges that in all cases of supposed typhoid, running an atypical course, especially if without

FIG. 47.



Tubercular tumor of the choroid penetrating the sclera. (zur NEDDEN.)

the Widal reaction, the choroid should be carefully examined for evidences of tuberculosis. In this connection one must bear in mind the possibility of actinomycosis, to be referred to under diseases of the retina.

### SYMPATHETIC DISEASE.

**Danger from a Blind Eye.** The dangers that may lurk in blind eyes are illustrated by a series of cases reported by Wescott.<sup>3</sup> In one case there were symptoms of eye-strain, headache, and vague discomfort, which were promptly relieved by removal of a blind globe containing an ossified choroid. In a second case vision was rapidly declining in

<sup>1</sup> Klin. Monatsbl. f. Augenh., October, 1903.

<sup>2</sup> Archives of Ophthalmology, September, 1903.

<sup>3</sup> American Medicine, August 29, 1903.

the right eye, the left having been perforated by a piece of steel twenty years before. In the third sympathetic inflammation had already commenced, and was not checked by the removal of the injured eye, which had been blind for eleven years, from a penetrating wound. In another case the removal of a blind eye revealed the unexpected presence in it of a piece of iron.

An extremely interesting case is reported by Zimmermann and Pusey.<sup>1</sup> When a little more than a year old, a girl had suffered from meningitis, with metastatic uveitis. The eye was quite blind, but remained quiet until, when she was fourteen years old, it became inflamed and painful. She complained of severe headaches, and when seen had a temperature of 100° F. and a pulse of 50 per minute. Symptoms of sympathetic irritation had appeared in the other eye. The blind eye was at once enucleated. The symptoms of threatening meningitis promptly disappeared, and her pulse and temperature soon became normal.

While most cases of sympathetic ophthalmitis occur within one year after the causative injury, it seems quite possible that pathogenic organisms may remain lodged within the eyeball, and retain their capacity for renewed activity and multiplication for many years. Browne and Stevenson<sup>2</sup> think that this retained capacity to cause disease is the probable explanation of the well-known fact that eyes which have suffered from sympathetic inflammation are almost certain to do badly after any operative disturbance of the iris, as iridectomy done with the hope of restoring some vision. They report two cases in which it was attempted to lessen the power of these dormant, pathogenic germs by a very free irrigation of the anterior chamber and wound of operation when doing iridectomy upon such eyes. In both cases previous attempts had been followed by severe and prolonged inflammation that quite destroyed what had been gained by operation. But after the prolonged irrigation with physiological salt solution the succeeding inflammation was comparatively trivial, and a good opening was gained in the iris, giving each patient useful vision.

Another case of sympathetic ophthalmitis, supervening one month after enucleation of the exciting eye, is reported by Nuel.<sup>3</sup> Like nearly all cases of the kind previously recorded, this one terminated in complete recovery. The benefit derived from enucleation, even after the beginning of sympathetic inflammation, is illustrated by two cases seen by Valois,<sup>4</sup> although he is inclined to emphasize the subconjunc-

<sup>1</sup> Annals of Ophthalmology, July, 1903.

<sup>2</sup> Ophthalmic Review, October, 1903.

<sup>3</sup> Annales d'oculistique, March, 1903, p. 211.

<sup>4</sup> Recueil d'ophtalmologie, April, 1903.

tival injections of mercuric cyanide as the essential part of the treatment. One of the eyes recovered full vision, and the other vision of 0.8.

The certainty of protection from sympathetic ophthalmia afforded by enucleation is the subject of a paper by Dianoux.<sup>1</sup> He asked eight of the most prominent French ophthalmologists if they thought sympathetic ophthalmia possible after a preventive enucleation. Not one of them had ever seen a case. Dianoux's own experience of twenty-seven years in a manufacturing city, embracing hundreds of enucleations, was the same. He points out that among all the reported cases of sympathetic inflammation following enucleation there is none, which he regards as authentic, beginning after the seventh week.

Some of the surgeons Dianoux addressed have seen sympathetic disease following exenteration, resection of the optic nerve, and other substitutes for enucleation. It is well to have our false hopes destroyed. Some of these have also been entertained with reference to the prophylactic powers of iodoform used in the treatment of wounds liable to cause sympathetic disease. Laas<sup>2</sup> reports a case of wound by a splinter of iron, in which the iodoform rods of Haab were introduced, and the injured eye apparently did well for a time; but sympathetic inflammation subsequently supervened.

## DISEASES OF THE RETINA

**Renal Retinitis.** This is the term preferred to *albuminuric retinitis* by Nettleship.<sup>3</sup> He discusses his experience of somewhat over one hundred cases, and touches on several points of general interest. This condition very rarely arises with acute nephritis. He has encountered no such case. When it appears to arise thus, all possible evidence bearing upon the previous condition of the kidneys should be carefully reported. Among the large number of persons who have chronic nephritis without symptoms, exacerbations are liable to arise, which may be taken for acute attacks.

In regard to the exudative and degenerative types of the disease, Nettleship holds almost exactly the views that have been previously expressed in these pages.<sup>4</sup> Omitting the cases connected with pregnancy, he finds, as others have found, that the proportions as to sex are about two males to one female. This is almost exactly the same as those observed in chronic kidney disease. In regard to age, the decade from fifty to sixty years yields the largest number of cases.

<sup>1</sup> *Annales d'oculistique*, June, 1903.

<sup>2</sup> *Klin. Monatsbl. f. Augenh.*; April, 1903.

<sup>3</sup> *Royal London Ophthalmological Hospital Reports*, October, 1903.

<sup>4</sup> *PROGRESSIVE MEDICINE*, June, 1900.

Nettleship's proportion of cases living more than two years after the discovery of the retinal lesions is exceptionally large. There were 10 out of 107, and, curiously enough, 7 of these were over fifty-five years of age when the retinitis occurred, while the other 3 were very young, five and one-half, twenty-one, and twenty-three years, respectively. Of the juvenile cases (under twenty-one years of age), Nettleship has 10; and he has found 14 others that have been previously recorded. Of these 24 patients, 10 were males and 14 females, almost a reversal of the usual proportions in older patients. Of 6, whose subsequent history was known, 4 died within five months; 1 lived three and one-half years, dying of phthisis and general amyloid disease; while 1 was living in good health at the age of twenty-five years, twenty years after the occurrence of the retinal lesions, although for ten years various examinations showed albuminuria, and the permanent lesions of the retina and optic nerve greatly reduced her vision.

Among the cases of *juvenile retinitis*, Nettleship has noted 1 case following stone in the bladder; 1 in hereditary syphilis, and 3 after scarlet fever. He regrets that he has not more evidence regarding these last two causes.

Nettleship infers that where the retina is atrophied by previous disease it is unable to take on the œdema and other changes of renal retinitis. He bases this upon a case in which the one eye had suffered from embolism of the retina, and in which the other eye subsequently presented a renal retinitis. Another patient was highly myopic in one eye, which showed only two small hemorrhages, while the normal fellow-eye had a typical retinitis. Reeve<sup>1</sup> also reported a case of high myopia, with extensive choroidal changes, in which the retinal lesions connected with renal disease were very slight.

Stricker<sup>2</sup> concludes that all the ocular complications of Bright's disease result from a chronic uræmia, and that an estimation of the total excretion of urea in the twenty-four hours is of more prognostic significance than the amount of albumin present. He recognizes, however, that it may not be the urea but other excrementitious substances which accompany it that are the real cause of the trouble.

**Retinitis of Pregnancy.** Nettleship's most interesting group of cases come under this head. There were 22 of them, and they bring out some important practical points. Among them he knew of only 5 deaths, and of these but 1 occurred within two years of the retinitis, the others living from three and one-quarter to seven years. He also knew of 6 other cases that have not died within two years, and 1 of

<sup>1</sup> British Medical Journal, September 26, 1903.

<sup>2</sup> Transactions of Section on Ophthalmology, American Medical Association, 1903.

which was living at the end of nine years, 1 ten, 1 eleven, 1 thirteen, and 1 twenty-four years. This contrasts very strongly with the usual mortality of renal retinitis not connected with pregnancy.

Of 19 cases in which the point was noted the retinitis occurred during the fifth, or a subsequent pregnancy in no less than 14, while in 4 it occurred in the first pregnancy. This is of especial interest in connection with the liability of albuminuria to arise during the first pregnancies. In 2 of the 4 cases subsequent pregnancies are known to have occurred without any return of the renal or eye symptoms, and the patients lived at least ten years afterward. Nettleship emphasizes the point that it usually takes several pregnancies to develop the renal retinitis, and that we are in need of information as to the previous condition of the kidneys in all these cases.

In most of Nettleship's cases there was some permanent impairment of vision, and in a few this was known to have increased subsequently. The same thing is shown by seven cases reported by Ahlstroem.<sup>1</sup> In one of these, allowed to terminate by a normal delivery, there was complete atrophy of both optic nerves. In another, in which the retinitis appeared at the second or third month, and delivery took place at the eighth month, there was marked atrophy and almost complete blindness. He finds that delivery soon after the retinal symptoms appear may be followed by restitution, but that delay may be fatal for vision.

**Renal Retinitis and Decapsulation.** Suker<sup>2</sup> undertook to estimate the value of the operation of decapsulation of the kidneys by a study of those cases in which it had been done in the presence of renal retinitis. He was able to collect 15 cases of the kind. Of these, 4 died within seventy-two hours after the operation, and only 1 lived more than a year. This is a mortality at least as high as that attending chronic Bright's disease with retinitis, without operation. It does not prove that the operation is useless in those cases that are free from retinitis; but until experience puts a wholly new light upon the subject renal retinitis must be considered a positive contraindication to such an operation for chronic nephritis.

**Retinal Hemorrhages.** The significance of hemorrhage into the retina, accompanying fracture of the base of the skull, has been studied by Flemming.<sup>3</sup> He has reported 12 cases. In 5 there was subarachnoid hemorrhage, chiefly confined to one side of the brain, and retinal hemorrhages confined to the eye on that side. In 2 cases the hemorrhage was about equal on the two sides, and in 5 cases no retinal hemorrhage occurred. He concludes that if subarachnoid hemorrhage

<sup>1</sup> Hygeia, lxv., No. 8.

<sup>2</sup> Transactions of Section on Ophthalmology, American Medical Association, 1903.

<sup>3</sup> Edinburgh Medical Journal, April, 1903.

develops rapidly it will cause retinal hemorrhages, and that if the former be unilateral the latter will also. Still, in exceptional cases a considerable hemorrhage may occur into the subarachnoid without any in the retina.

**Retinal Lesions of Actinomycosis.** A case is reported by Mueller<sup>1</sup> in which a man, aged twenty-two years, presented in both eyes small yellowish-white patches, varying in diameter from that of a large retinal vein to one-quarter the diameter of the optic disk. A retinal vein crossed clearly in front of one of them. These changes in the eye-ground helped to confirm a diagnosis of general miliary tuberculosis. Post-mortem examination, however, showed that the disease was really miliary actinomycosis, and that the lesions were situated in the retina, not in the choroid. The retinal nodules were composed of large, mono-nuclear epithelial-like cells, such as are found when the reaction of the tissue causes the local destruction of the fungus. The possibility of such a mistake in diagnosis should be borne in mind in connection with tuberculosis of the choroid.

#### DISEASES OF THE OPTIC NERVE.

**Optic Neuritis and Brain Disease.** Two cases of *cerebral cysticercus* with optic neuritis are reported by Jacoby.<sup>2</sup> In one the choking of the disk caused retinal hemorrhages ; in the other there was no hemorrhage, although the swelling of the disk amounted to 5 D. In a case of tumor of the cerebellum, with the usual dilatation of the optic nerve sheath just back of the eyeball, A. Knapp<sup>3</sup> found on microscopic examination complete absence of inflammatory products in the optic nerve and papilla. There was simply edema, with moderate venous stasis of the optic nerve and papilla, and distention of the subarachnoid space. He regards it as a case of pure choked disk.

Yamaguchi<sup>4</sup> reports a case of tumor of the base of the brain situated anteriorly, in which the choking of the disk grew worse from time to time and thrombosis of the central retinal vein occurred.

**Other Forms of Optic Neuritis.** Caudron<sup>5</sup> reports a case in which there were recurring attacks of choking of the optic disk and intermissions of marked improvement in the retinal circulation. These attacks commenced about eighteen months after *hysterectomy* with removal of the ovaries in a woman aged thirty years. Wagner<sup>6</sup> en-

<sup>1</sup> Klin. Monatsbl. f. Augenh., March, 1903.

<sup>2</sup> Ibid., September, 1903.

<sup>3</sup> Archives of Ophthalmology, May, 1903, p. 285.

<sup>4</sup> Klin. Monatsbl. f. Augenh., Supplement, 1903.

<sup>5</sup> La clinique ophtalmol., April 25, 1903.

<sup>6</sup> Klin. Monatsbl. f. Augenh., July, 1903.

countered a case of *myxoedema* in which neuroretinitis occurred, reducing the patient's vision at one time to  $\frac{1}{10}$ . Under thyroid feeding the vision and the eye-ground became normal. A case of *neuroretinitis*, with paralysis of the left sixth nerve, coming on six weeks after confinement, is reported by Chevallereau and Chaillous.<sup>1</sup> There were retinal oedema and white spots in the region of the macula, but the urine was free from albumin or sugar. Lumbar puncture was followed by notable improvement, and vision rose to right  $\frac{5}{6}$  and left  $\frac{5}{10}$ .

Gamble<sup>2</sup> reports a case of double optic neuritis observed four weeks after the beginning of *whooping-cough* and ending in recovery some six months later. Full vision was retained throughout.

A case of *idiopathic optic neuritis* is reported by Kipp.<sup>3</sup> Both eyes were involved, and for five days the patient, a woman aged thirty-two years, was unable to tell light from darkness, and all reaction of the pupil to light was lost. Then improvement began, and within three months vision was restored to normal. Five years afterward the patient's vision continued normal and her health excellent.

**Retrobulbar Neuritis.** *Lead poisoning* with optic neuritis ending in optic atrophy is reported by Chevalier.<sup>4</sup> The patient was a house painter, aged twenty-five years, who had been engaged in this work since he was fifteen years old. In this case there had been marked cerebral symptoms, besides lead colic and motor disorders. The neuritis might be regarded as consecutive to the cerebral disease, but it was retrobulbar in type. The line between ordinary and retrobulbar neuritis cannot be very definitely drawn.

The following cases, clearly retrobulbar in origin, presented many of the appearances of ordinary optic neuritis.

In a case of bilateral *syphilitic orbital periostitis* seen by Hotz,<sup>5</sup> there occurred severe optic neuritis in both eyes. Vision was reduced to counting fingers. Under mercurial inunctions and increasing doses of potassium iodide, up to 120 grains three times daily, the optic nerves cleared up and vision rose again to normal. In this case soreness on pressing the eyeball backward was quite marked.

Wilmer<sup>6</sup> saw a girl, aged eight years, who had been struck on the left side of the nose with a base-ball bat. She was not knocked down, but there was a good deal of bleeding from the nose. Three days later she was blind in the right eye, and the next day sight failed in the

<sup>1</sup> Recueil d'ophtalmologie, December, 1903.

<sup>2</sup> Archives of Ophthalmology, July, 1903.

<sup>3</sup> Journal of the American Medical Association, December 5, 1903.

<sup>4</sup> Annales d'oculistique, May, 1903, p. 397.

<sup>5</sup> Ophthalmic Record, July, 1903.

<sup>6</sup> Transactions of the American Ophthalmological Society, 1903.

left. She presented marked double optic neuritis when first seen, at the end of nine days. She was treated by rest in bed, calomel internally, and ice applications externally. Next day she had good perception of light; and at the end of one week vision equal  $\frac{1}{200}$  in each eye. At the end of two months vision was normal, and the neuritis had entirely subsided.

**Optic Atrophy.** Atrophy of the optic nerve in a case of *diabetes* is reported by Stoewer.<sup>1</sup> Vision had been noticeably impaired for a year, and was reduced to  $\frac{4}{25}$ . Under injections of strychnine it improved to  $\frac{4}{15}$ , and this improvement was maintained while the patient remained under observation.

Four cases of optic atrophy from *tumor involving the optic chiasm* are reported by Yamaguchi.<sup>2</sup> In each instance the temporal portion of the field of vision was lost; and usually there was some narrowing of the nasal portion of the field.

**Treatment of Tabetic Atrophy.** Of 12 patients suffering from tabetic atrophy of the optic nerve seen by Dor<sup>3</sup> in the last four years, 6 were treated with large doses of potassium iodide. Of these, 4 became blind, and the other 2, who still saw a little, seemed to progress rather more slowly after the use of the iodide was stopped. The other 6 cases took no iodide; 1 received zinc phosphide, and the others strychnia hypophosphite. In 3 the disease seemed to be arrested, with retention of vision sufficient for reading; in 1 patient for three years; in 2 others for one and one-half years. One patient had died of general paralysis; 1 had become blind; and 1 had been under observation but a short time. Dor recognizes that his favorable cases may be only coincidences. But he believes that in this condition the iodides do more harm than good.

Fabre<sup>4</sup> attempts to outline a pre-atrophic stage in disease of the optic nerve attending tabes. This stage may be indicated by palsies of the ocular muscles, accommodative asthenopia, a diminution in ability to distinguish differences of light, dyschromatopsia, periorbital neuralgia, anaesthetic zones, epiphora, myosis, the Argyll-Robertson symptom, hippus, inequality of the pupils, and chronic spasm of the ocular muscles. During this pre-atrophic stage Fabre urges that an active mercurial treatment will prove effective in checking the disease. Of course, alleged successes from a preventive treatment of optic atrophy will be regarded with great skepticism. Still, the symptoms mentioned might be carefully and systematically looked for, and the coexistence of two or more of them would constitute a fair indication for treatment.

<sup>1</sup> Klin. Monatsbl. f. Augenh., August, 1903.

<sup>2</sup> Ibid., Supplement, 1903.

<sup>3</sup> Annales d'oculistique, April, 1903.

<sup>4</sup> Recueil d'ophtalmologie, October, 1903.

## TOXIC AMBLYOPIAS.

**Methyl Alcohol.** Under the propelling force of large commercial profits, wood alcohol is still being distributed to kill and blind the unsuspecting. Main<sup>1</sup> reports a case of blindness, followed by death, from the drinking of "lemon extract" made with methyl alcohol. He has also collected ten similar cases of poisoning occurring in his immediate locality in the last few years. The large number of cases seen by a few observers indicates that striking as is the picture of methyl alcohol poisoning, it must frequently pass unrecognized. Five cases are reported by Sherer.<sup>2</sup> Four men participated in a "cheap alcohol" debauch. One died, one became totally blind, one became practically blind, and the other finally recovered vision of  $\frac{1}{2}$  and  $\frac{1}{2}$ . In his fifth case there was absolute central scotoma, contraction of the visual field, and vision reduced to the perception of large moving objects in the portion of the field remaining. Cases of similar poisoning by "essence of Jamaica ginger" are reported by Turner and Posey.<sup>3</sup> In all these cases the usual symptoms of methyl alcohol poisoning were present.<sup>4</sup>

**Rare Toxic Amblyopias.** A case of amblyopia ascribed to the excessive use of *coffee* is reported by Wing.<sup>5</sup> A boy, aged eight years, had gradual failure of vision, noticed by his mother for six months. Central vision was  $\frac{2}{20}$ , and the visual fields were greatly contracted. The optic disk was much congested; its outlines could hardly be distinguished. The retinal veins were large and the arteries small. The boy was using six to eight cups of strong coffee daily, and no other cause for the amblyopia could be discovered. The use of coffee was stopped and strychnine given,  $\frac{1}{5}$  of a grain three times daily. In eight days vision had risen to  $\frac{2}{20}$ , though still "slow and hazy;" and the visual field was markedly increased. Three weeks later vision was  $\frac{4}{20}$ , but the visual field was not yet normal.

Amblyopia from the use of *chocolate* has been reported; and three years ago two cases apparently due to the excessive use of *tea* were mentioned in these pages.<sup>6</sup> It seems fairly certain that these drugs in sufficient dose are capable of doing serious damage to the retina and optic nerve. In the cases reported as due to tea and chocolate, however, there was marked central scotoma, rather than concentric narrowing of the visual fields. We have not, therefore, the clinical picture of

<sup>1</sup> American Medicine, September 5, 1903.

<sup>2</sup> Philadelphia Medical Journal, May 9, 1903.

<sup>3</sup> Ophthalmic Record, March, 1903, p. 128.

<sup>4</sup> PROGRESSIVE MEDICINE, June, 1900.

<sup>5</sup> Annals of Ophthalmology, April, 1903.

<sup>6</sup> PROGRESSIVE MEDICINE, June, 1901.

an especial form of amblyopia that can be ascribed to poisoning by these closely allied drugs.

Amblyopia has been recognized as a common symptom of poisoning by *male fern* (*aspidium, filix mas*) ; but well-reported cases have been few. Haberkamp<sup>1</sup> reports two affecting men of middle age. In both cases the impairment of vision was noted only after the third dose of 10 grains in one case and 8 grains in the other of the ethereal extract. The first patient suffered from sickness and vomiting and became somnolent. The second was free from these symptoms. Both, on awakening, found themselves suddenly and entirely blind. In the first case vision of  $\frac{3}{5}$  was recovered after several weeks ; in the other there was no return of vision.

A case of poisoning by *potassium chlorate*, attended with amblyopia, is reported by Roselli.<sup>2</sup> A man with a sore throat gargled repeatedly with a very strong solution. He suffered from malaise, vomiting, and abdominal pain ; and objects appeared distorted and concealed by a mist. The pupils responded poorly to light. Improvement began on the third day, and recovery was complete at the end of a week.

Amblyopia from *fungus poisoning* is reported by Valenti.<sup>3</sup> A man aged twenty-six years, after eating a species of amanita, mistaken for the edible mushroom, experienced the usual symptoms of amanita poisoning and pain in the right eye, aggravated by movement of the eyeball. The vision became impaired in the periphery of the field, and later the left eye was similarly affected. By the twenty-second day he could distinguish only light and darkness. The ophthalmoscope showed narrowing of the retinal arteries and distention of the veins. After eight days improvement commenced, and at the end of a month complete restoration was hoped for. But relapse occurred, and in the end vision of  $\frac{3}{10}$  was regained.

The important part of the treatment seems to have been the use of strychnine and tonics.

#### DISEASES OF THE CRYSTALLINE LENS.

**Cataract.** Any study of the causation of cataract leads to the deep problems of nutrition, and so acquires a general interest and importance. Uribe-Troncoso<sup>4</sup> has investigated the composition of the aqueous humor in cases of senile cataract and, for comparison, in eyes free from cataract. He finds, contrary to what has been believed, no increase in the

<sup>1</sup> Wochenschr. f. Therap. u. Hygiene des Auges, June 18, 1903.

<sup>2</sup> Bollettino dell' ospedale otalmico, April, 1903.

<sup>3</sup> Annals of Ophthalmology, April, 1903, p. 346.

<sup>4</sup> Annales d'oculistique, August, 1903.

albumin. But in commencing nuclear cataract there is a considerable increase in the proportion of the saline constituents of the aqueous. This he did not observe in cases of commencing cortical cataract. When the cataract reaches maturity the composition of the aqueous again approaches normal. In hypermature cataract the aqueous shows an augmentation in the proportion of organic matter.

**RESULTS OF CATARACT EXTRACTION.** The results of this operation were not revolutionized ; indeed, they were not materially altered by the introduction of antiseptic surgery. On that account it has significance as illustrating important surgical principles that were not introduced by Lister. Its results still bear testimony to the importance of a good operative technique. Maynard,<sup>1</sup> in 1000 consecutive cases of cataract extraction, obtained a good result (vision  $\frac{1}{2}$  or over) in 89 per cent. ; vision poor, but sufficient for the patient to go alone, in 5.7 per cent. ; failure in 4.5 per cent., of which 3.6 per cent. were due to sepsis. It may be noted that in addition to the ordinary washing and douching of the conjunctiva with mercurial solutions, the eyelashes were cut the day before operation, the conjunctival sac washed out with a sublimate solution, and a bandage applied. I have repeatedly expressed distrust of this preliminary bandaging, believing that it places the eye in a condition more favorable for the multiplication of pathogenic germs. Thirty-six eyes lost by sepsis out of 1000 is a very large proportion for a series of cataract extractions at the present time. It is true that Maynard's patients in India are probably more prone to infection than are those encountered in America or Western Europe.

But we have for comparison a series of 1023 cases reported by Smith<sup>2</sup> from the hospital at Jallundhar, India. These cases are not accurately recorded as to the vision obtained, but 99.42 per cent. are set down as "first-class results." They do not represent all the cases operated on during the period covered. Sixty were excluded as unsuitable for the particular operative procedure reported upon—extraction with the capsule. But if all sixty had been failures, the total failures would still have been less than 1 per cent. On looking for the possible causes for such a high percentage of successes, we find that "the only sponging, washing, or douching" used was a preliminary washing of the conjunctiva with a 1 : 2000 sublimate solution. The lens was extracted in its capsule after an iridectomy ; and the eye immediately closed without "fiddling." Perhaps most important is the fact that Smith has had a personal experience of over 8500 cataract extractions, and that the cases forming the basis of his paper were operated

<sup>1</sup> India Medical Gazette, February, 1903.

<sup>2</sup> British Medical Journal, September 26, 1903.

on in the first four months of 1903 ; "twenty to thirty cataracts in the hour." Smith's cases are not reported with sufficient detail to make them a good basis for comparison. But his positive statement that but two eyes were lost by suppuration emphasizes the enormous importance of a good operative technique in preventing infection.

### GLAUCOMA.

**Drugs Causing Glaucoma.** Another case of acute glaucoma provoked by the use of *euphthalmine* is reported by Ring.<sup>1</sup> The patient gave a history of attacks of pain in and above the eye, with reduced vision and mild congestion, recurring over a period of several months. Pain came on a few hours after instillation of euphthalmine, and the attack of glaucoma was severe and prolonged. Iridectomy was done on the fourteenth day, and the final result was normal vision and freedom from glaucomatous attacks.

The increased tension caused by *adrenalin* was the subject of an important discussion before the Ophthalmological Society of the United Kingdom. MacCallan<sup>2</sup> reported five cases of glaucoma in which the use of instillations of adrenalin was promptly followed by a very marked and rapid increase of the intraocular tension. Harman and Jessop had also seen cases indicating that the use of the drug was attended with danger of increased tension. The matter is of importance, because adrenalin has been strongly recommended for the treatment of glaucoma by Darier<sup>3</sup> and others. Parsons and Snowball,<sup>4</sup> in an experimental investigation of the relations between intraocular tension and the blood pressure, found that a rise in blood pressure produced a passive increase of the intraocular tension, and that this occurred when the change of blood pressure was caused by various drugs, including adrenalin. They also found that pressure of the extraocular muscles (both striated and unstriated) upon the eyeball produced such marked changes in the intraocular tension that it was necessary to fully curarize the animal to exclude errors from this source.

**Treatment of Glaucoma.** The permanent effect of iridectomy in glaucoma has been studied by Wygodski.<sup>5</sup> He tabulated the results observed after a minimum of two years. Among 37 cases of acute glaucoma he found 76 per cent. improved, 5 per cent. unchanged, 11 per cent. that had grown worse, and 8 per cent. completely blind. Of

<sup>1</sup> Transactions of the American Ophthalmological Society, 1903.

<sup>2</sup> Ophthalmic Review, July, 1903, p. 206.

<sup>3</sup> A. Darier, Ocular Therapeutics, 1903.

<sup>4</sup> Royal London Ophthalmological Hospital Reports, vol. xv., part iii.

<sup>5</sup> Klin. Monatsbl. f. Augenh., September, 1903.

chronic inflammatory cases he had 147, among which 10 per cent. improved, 40 per cent. remained unchanged, 30 per cent. deteriorated, and 20 per cent. became entirely blind. Among 129 cases of simple glaucoma only 1 improved and 15 per cent. remained stationary; 49 per cent. deteriorated and 36 per cent. became blind. Wygodski's figures express in statistical form the general conviction of the profession, that iridectomy is a very satisfactory operation for acute glaucoma, and may be of benefit in simple glaucoma. It is an operation, however, that need not appeal wholly to its permanent results for its justification. If it gives positive benefit, even for a short time, it should be done; and the temporary results are much more favorable than the permanent. Thus, Wygodski in his 458 cases obtained immediately favorable results in 100 per cent. of the acute cases, 94 per cent. of the chronic inflammatory cases, and 90 per cent. of cases of simple glaucoma.

**The Relation of the Cervical Sympathetic to the Eye** was the subject of an important symposium and discussion at the last meeting of the American Medical Association. The papers then read by de Schweinitz, Wilder, Ball, and Weeks, with the resulting discussion, have been published in book form.<sup>1</sup> They show substantial agreement upon the proposition that we cannot yet decide the value of sympathectomy in the treatment of glaucoma. It is now generally recognized, as I have urged before,<sup>2</sup> that the bulk of reported cases, being hopeless with any method of treatment, were unsuitable for testing the value of a new operation; while the more favorable cases upon which it has been tried are still too few to furnish any important conclusions. Wilder reports 7 cases from his own practice, and collects 61 others in which sympathectomy has been done for glaucoma in this country. The results obtained he summarizes in the following table, which, in its main features, corresponds closely with the table of results in 114 cases collected by Rohmer.<sup>3</sup>

#### WILDER'S SUMMARY.

Form of glaucoma.	No. of cases.	Improved.	Temporarily improved.	Stationary.	Unimproved.
Simple chronic . . . . .	38	15	5	3	15
Chronic inflammatory . . . . .	16	4	3	3	6
Subacute . . . . .	4	3	1		
Acute . . . . .	3	1	1	1	
Absolute . . . . .	4	1	...	...	3
Hemorrhagic . . . . .	2	2			
Buphtalmos . . . . .	1	...	...	...	1
	—	—	—	—	—
	68	26	10	7	25

<sup>1</sup> Relation of the Cervical Sympathetic to the Eye, Chicago, 1904.

<sup>2</sup> PROGRESSIVE MEDICINE, June, 1902.

<sup>3</sup> Annales d'oculistique, May, 1902.

It will be noted that the results obtained in acute and subacute cases are not better than those obtained by iridectomy. This is supported by the negative results obtained by Lagrange<sup>1</sup> in two cases recently reported. In simple glaucoma the influence of the operation seems to be favorable.

Most striking is the fact that both of the hemorrhagic cases were improved. This was also true of Rohmer's cases, five of which were hemorrhagic. In view of these seven successes and no failures in hemorrhagic glaucoma, we are justified in urging that sympathetomy be advised in all such cases, unless the patient's general condition furnishes a strong contraindication to any serious operative interference. As to forms of glaucoma other than hemorrhagic, the conservative ophthalmologist will still be interested in learning the value of sympathetomy through the experience of his colleagues.

### LACRYMAL APPARATUS.

**Dislocation of the Lacrymal Gland.** Although this is rare, it probably is not so extremely rare as the literature regarding it would indicate. Roy,<sup>2</sup> reporting a case of his own, is able to collect only 16 others, of which but 5 seem to have been spontaneous. Yet I can recall 2 cases of spontaneous dislocation that have been under my own observation. In 3 of the cases collected by Roy the displacement of the gland seems to have been due to swelling or cicatricial contraction of neighboring parts. The causes of "spontaneous" dislocation have not been determined. In both the cases I have seen the development of the tumor was perfectly gradual. One of these patients suffered from chronic bronchitis. In Roy's case the swelling dated from an attack of bronchitis. In other cases it is said to have appeared quite suddenly.

During the past year 4 cases of traumatic dislocation have been reported : 2 by Purtscher,<sup>3</sup> and 1 each by Villard<sup>4</sup> and Kuropatwinsky<sup>5</sup>. I have recently seen a case of the kind,<sup>6</sup> and have been able to collect accounts of 12 others. Traumatic dislocation has generally occurred in connection with a penetrating wound of the lid, the gland being found hanging in the wound. Usually it has occurred in children, but 3 of the patients were adults. Careful cleansing of the

<sup>1</sup> *Annales d'oculistique*, June, 1903.

<sup>2</sup> *American Journal of the Medical Sciences*, January, 1904.

<sup>3</sup> *Centralbl. f. p. Augenh.*, December, 1903.

<sup>4</sup> *Revue générale d'ophtalmol.*, May, 1903.

<sup>5</sup> *Postep Okulistyczny*, May, 1903.

<sup>6</sup> *Ophthalmic Record*, 1904.

wound, return of the gland to position, and its retention by sutures have usually been followed by complete cure ; but excision may be necessary.

### OCULAR LESIONS OF GENERAL DISEASE.

**Chronic Cyanotic Polycythaemia.** Under this name Hall<sup>1</sup> has reported 2 cases of a condition characterized by an unusual increase in the number of red blood cells and chronic cyanosis ; and Osler<sup>2</sup> has brought together 8 other cases, 2 of which were under his own care. In one of these cases (Stockton's) it was noted : " Both disks were hyperæmic ; retina surrounding the disks thickened ; vessels, particularly veins, engorged and tortuous." In one other case (McKeen) it is noted : " eyes congested." In one of Cabot's cases it is stated : " there are no eye symptoms." But apparently in most cases no ophthalmoscopic examination was made. I had the opportunity of studying Hall's case, and the ophthalmoscopic appearances were so striking and characteristic that I think ocular changes should always be looked for in connection with this disease. The general color of the fundus was good ; the retinal arteries were normal in size and appearance ; but the retinal veins were enormously distended, sacculated, tortuous, and of extremely dark color. In the left eye an especially large varix occupied the centre of the optic disk. Vision in this eye was reduced to counting fingers at one foot in the lower quadrant of the field. The outer quadrant of the disk was rather pale. There was no other discoverable cause for the reduction of the vision. There was no perceptible lesion of the macula. The conjunctival veins were dilated, tortuous, and very dark.

**Measles.** In a few cases noticeable changes in the fundus of the eye are found to accompany the prolonged asthenopia that sometimes follows measles. In very rare instances blindness has been ascribed to this disease. A case of the kind is reported by Rollet.<sup>3</sup> A girl, aged thirteen years, after a mild attack of measles, without complications or marked involvement of the eyes, awoke blind. When seen some months later her vision was  $\frac{4}{5}$  ; and the visual field contracted to a circle included within 10 degrees of the fixation point in the right eye, and within 15 degrees in the left. The pupils were widely dilated and insensitive to light. The general color of the fundus was a dull orange-yellow, shading into gray about the macula and optic disk. The outline of the disk was slightly indistinct ; the retinal vessels, both arteries and veins, were greatly contracted.

<sup>1</sup> American Medicine, June 27, 1903.

<sup>2</sup> American Journal of the Medical Sciences, August, 1903.

<sup>3</sup> La clinique ophtalmol., July 25, 1903.

The common ocular lesions of measles are conjunctival and corneal. Trautas<sup>1</sup> describes a fine punctate opacity of the cornea which he observed in 31 out of 41 cases. This was limited to the centre of the cornea, appeared on the first to the fifth day of the eruption, and disappeared entirely in a very few days.

Morax<sup>2</sup> finds a form of blepharoconjunctivitis that may properly be said to belong to the disease. It may precede, accompany, or follow the eruption; but it always appears after the beginning of the general symptoms. Itching, photophobia, and lacrymation are complained of; but the symptoms are not severe, and they subside in from one to ten days. Besides this condition, which is a part of the disease, measles may intensify a pre-existing conjunctivitis, or may be followed by conjunctival or corneal inflammations, especially of the phlyctenular form. On bacteriological examination of 22 cases Morax found no especial organism. In 4 cases of conjunctivitis, superadded to measles, he found the Koch-Weeks bacillus in 2, and the bacillus of Pfeiffer and the diplobacillus in 1 each. So important are these forms of conjunctival inflammation which may follow measles that Suker<sup>3</sup> suggests the prophylactic treatment of the eyes in scrofulous and debilitated children suffering from measles, to ward off an inflammation that might be prolonged and might do permanent harm.

**Tuberculosis.** The more important ocular lesions of tuberculosis have been noticed under disease of the conjunctiva, cornea, and uveal tract. The tendency of choroidal tuberculosis to involve the sclera and extend into the orbit has already been referred to. Rogman<sup>4</sup> reports 2 cases of the kind. The eyes were enucleated, but the patients both died; one of meningitis, the other of pulmonary tuberculosis. He has collected 9 cases that have terminated in death after enucleation, and thinks it possible that in some instances the operation may have opened the path to cerebral or general infection. On the other hand, in 2 cases reported by Spalding,<sup>5</sup> the results of enucleation were very satisfactory. In 1 of these cases symptoms of meningitis, which had been present, immediately disappeared after enucleation. In the other case the fellow-eye had been showing signs of sympathetic irritation. Both patients continued well after the removal of the diseased globes.

The introduction of virulent tubercle bacilli into the blood is found by Stock<sup>6</sup> to cause, in dogs, ocular manifestations of tuberculosis. In addition to the choroid, ciliary body, and iris, the optic nerve and retina were sometimes involved. In 1 case there was a commencing

<sup>1</sup> Annales d'oculistique, August, 1903.

<sup>2</sup> Ibid.

<sup>3</sup> Medicine, September, 1903.

<sup>4</sup> Annales d'oculistique, August, 1903.

<sup>5</sup> Transactions of the American Ophthalmological Society, 1903.

<sup>6</sup> Klin. Monatsbl. f. Augenh., Supplement, 1903.

cataract ; in 2 cases parenchymatous keratitis occurred. In 6 out of 8 cases examined, the caruncle (the Harderian glands) was found involved. In the cases of keratitis there was also an ulcerative conjunctivitis. The possibility of an endogenous origin for any of the ocular lesions of tuberculosis should be given due weight before deciding on the excision of an ocular focus of the disease. If there is general infection, and the patient's life can be saved by general antitubercular treatment, it is probable that the ocular lesions will improve as rapidly as any others.



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